Operating Manual

INTRAPAL -
Collaborative Gripping Module for Intralogistics

December 2025

Contents

1 Introduction

These instructions are part of the gripping module and describe safe and proper use in all operating phases. It applies exclusively to INTRAPAL 1200-280 gripping modules and contains important information on installation, commissioning, maintenance and service.

1.1 Product description

The INTRAPAL 1200-280 gripping modules are universal servo-electric gripping modules with innovative gripping force control and Ethernet interface for use in robot applications. Figure 1 shows the connections and components of an INTRAPAL 1200-280 gripping module. The gripping module is configured via the integrated web interface.

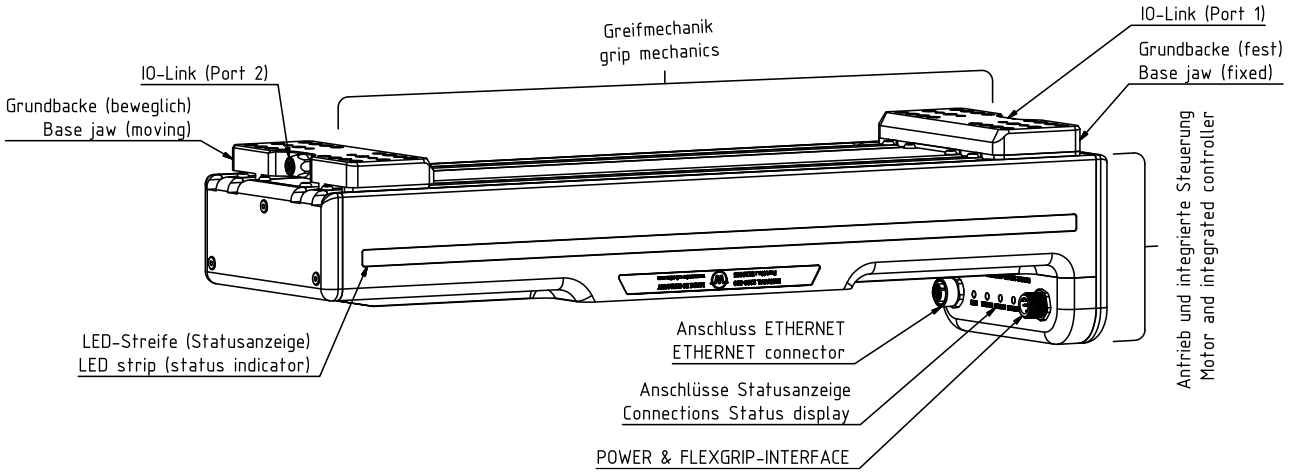


Figure 1: Components and connections of the gripping module

1.2 Related documents

The following additional documents for operating the gripping module are part of the documentation package:

- Technical drawing
- 3D model (STEP)
- Interface description GRIPLINK protocol

The documents can be found at **www.weiss-robotics.com/intrapal/#downloads**. Additional information on the warranty can be found in our General Terms and Conditions, which are available at **www.weiss-robotics.com/agb** .

1.3 Target audience

The target audience for these instructions are plant manufacturers and operators who should keep this, and other documents always supplied accessible to personnel and, in addition, encourage them to read and observe the safety and warning instructions in particular.
It is also intended for qualified personnel and installers who should read these instructions and always observe and comply with the safety and warning instructions.

1.4 Notation and symbols

The following symbols are used in these instructions to provide a better overview.

Functional or safety-relevant information. Non-compliance may endanger the safety of personnel and the system, damage the appliance or impair the function of the appliance.

Additional information for a better understanding of the matter described.

Reference to further information.

2 Basic Safety Notes

2.1 Intended use

The gripping module is designed for gripping and reliably holding workpieces or objects and is intended for installation in a machine. The requirements of the applicable directives as well as the assembly and operating instructions in this manual must be observed and complied with. The gripping module may only be used within the scope of its defined application parameters and only in industrial applications.
Any other use or use beyond this is considered improper, e. g. if the gripping module is used as a pressing, cutting, lifting or punching tool or as a clamping device or guiding aid for tools. The manufacturer is not liable for any damage resulting from this.

2.2 Ambient and operating conditions

The gripping module may only be used within its defined application parameters. It must be ensured that the gripping module and the fingers are sufficiently dimensioned for the application, that the environment is clean and that the ambient temperature corresponds to the specifications in the data sheet. Observe the maintenance instructions (see chapter 12). Furthermore, it must be ensured that the environment is free of

splash water and vapors as well as abrasion or process dust. This does not apply to modules that are specially designed for dirty environments.

Cleaning agents must be checked for compatibility with the external materials of the gripping module!

2.3 Product safety

The gripping module corresponds to the state of the art and the recognized safety rules at the time of delivery. However, hazards may emanate from it if, for example:

- the gripping module is not used as intended
- the gripping module is improperly mounted, modified or incorrectly maintained
- the EC Machinery Directive, the VDE Directives, the safety and accident prevention regulations applicable at the place of use or the safety and assembly instructions are not observed

2.3.1 Protective devices

In order to be able to dispense with protective devices in accordance with the EC Machinery Directive, a risk assessment in accordance with the applicable directives/standards is necessary.

2.3.2 Structural changes, extensions or conversions

Additional holes, threads or attachments that are not offered as accessories by WEISS ROBOTICS may only be attached after written approval by WEISS ROBOTICS.

2.3.3 Special standards

The gripping module complies with the following standards:

- Radio interference voltage, interference field strength and radiation according to EN 61000-6-3
- Fast transients on signal and data lines according to EN 61000-4-4
- HF current injection on signal and data lines according to EN 61000-4-6
- RF irradiation according to EN 61000-4-3
- Interference emission according to EN 61000-6-4 Class A
- Magnetic field with power frequency according to EN 61000-4-8
- Discharge of static electricity according to EN 61000-4-2

2.4 Personnel qualification

Installation, initial startup, maintenance and repair of the gripping module may only be performed by trained specialists.
Any person assigned by the operator to work on the gripping module must read the complete operating manual. In particular, chapter 2 "Basic Safety Notes" must be read and understood. This also applies to personnel who are only occasionally assigned, for example maintenance personnel.

2.5 Safety-conscious working

The safety and accident prevention regulations valid at the place of use must be observed.

Avoid moving parts by hand when the power supply is connected.

Do not reach into the open mechanics. Avoid reaching into the movement range of the gripping module.

Disconnect the power supply of the gripping module before carrying out any work.

2.6 Notes on special hazards

Risk of injury from falling and ejected objects! Provide protective devices to prevent objects from falling or being thrown out, e.g. machined workpieces, tools, chips, fragments, waste.

Risk of injury due to unexpected movements of the machine/plant! Perform risk assessment and take countermeasures.

3 Warranty

The warranty period is 12 months from the date of delivery to the factory, provided the machine is used for its intended purpose in single-shift operation and the prescribed maintenance and lubrication intervals or 10 million gripping cycles are observed. Parts that come into contact with the workpiece and wear parts (seals, wipers) are not covered by the warranty.
Please also refer to the General Terms and Conditions (GTC).
The gripping module is considered defective if its basic function, gripping, is no longer available.

4 Scope of delivery and accessories

The scope of delivery includes

- INTRAPAL 1200-280 gripping module in the version ordered
- Accessory pack (material according to list)
- Documentation package in electronic form

Size	INTRAPAL 1200-280
Gripper module	5120025
Accessory kit	5020100

Table 1: Part numbers Scope of delivery

The supplied accessory kit contains the following parts:

Size	INTRAPAL 1200-280
Dowel pin ISO 2338 - 4m6 x 10	4
Dowel pin ISO 2338 - 8h8 x 14	2
Hex Screwdriver 2 mm	1

Table 2: Accessory kit scope of delivery

The following accessories are available separately for the gripping module:

- Ethernet data cable, M12 4-pin, D-coded to RJ 45, 5m (TN 5070031)
- Connection cable, M12 5-pin, A-coded to free LE, 5m (TN 5070032)
- Other variants of data and connection cables on request
- Integration solutions for integrating the gripping module into a robot controller.

Order accessories separately.
Further accessories can be found on our website at ***www.weiss-robotics.com.***

5 Technical data

5.1 Mechanical nominal data

The gripping module may be damaged if the specified nominal data is exceeded.
If in doubt, clarify your application with our technical sales department.

Mechanical operating data	Unit	INTRAPAL 1200-280
Total stroke[1]	mm	282
Effective stroke	mm	280
Nominal gripping force	N	1200
Minimum gripping force	N	150
Max. relative finger speed	mm/s	190
Min. relative finger speed	mm/s	5
Max. relative finger acceleration	mm/s²	3000
Min. relative finger acceleration	mm/s²	100
Workpiece weight (form fit)	kg	60
Workpiece weight (force fit)	kg	30
Permissible finger length (L)[2]	mm	300
Permissible mass of the finger	kg	5,5
Protection class of gripping mechanism	IP	IP 40 | IP 54 on request
Protection class control unit	IP	IP 40 | IP 54 on request
Ambient temperature	°C	0 ... 50
Air humidity	%	0 ... 100
Mechanical repeatability	mm	± 0,02
Position measuring system		Relative|absolute on request
Resolution of the displacement encoder	mm	0,0002
Accuracy of the displacement encoder	mm	± 0,05
Weight (incl. mounting plate)	kg	6,2

Table 3: Mechanical nominal data

[1] The total mechanical stroke is 282 mm. However, it is recommended to maintain a minimum distance of 1 mm from the end stops on both sides during operation.

[2] For nominal force, see dimension "L" inFigure 2

5.1.1 Permissible finger length

The permissible finger length *L* corresponds to the distance between the center of the mounting surface of the base jaw and the effective gripping force application point, see Figure 2. Maximum values for *L* can be found in the mechanical nominal data for the size used. If the maximum finger length is exceeded, the gripping force must be reduced. The service life may also be reduced.

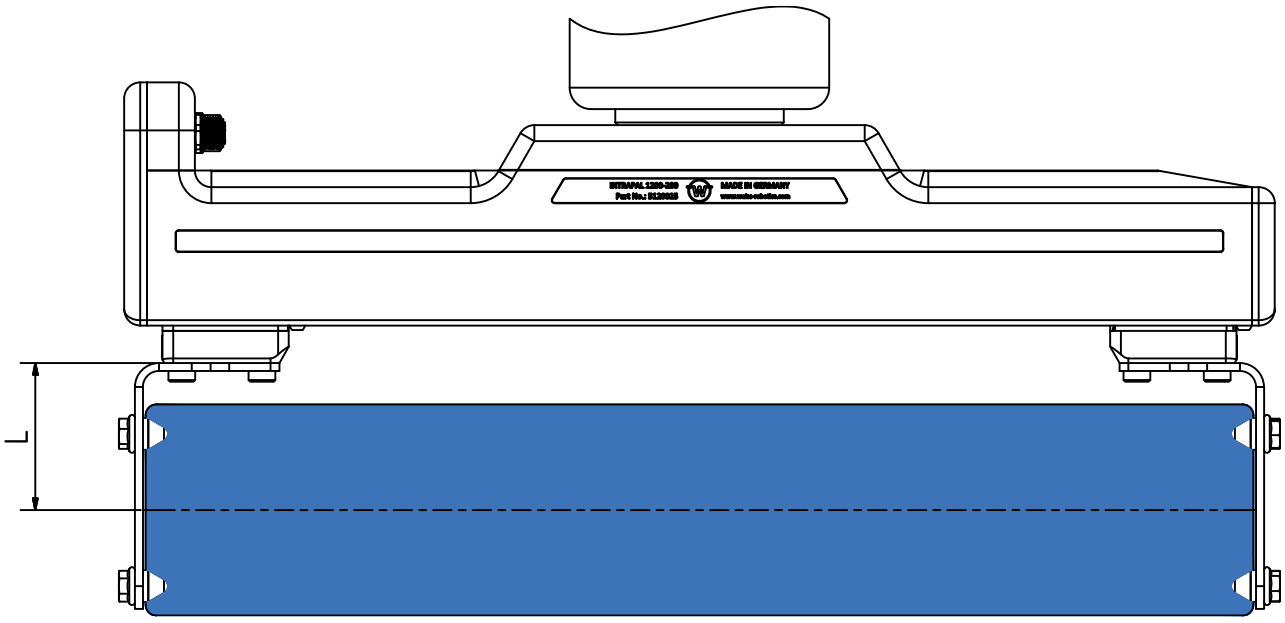


Figure 2: Determining the finger length "*L*".

5.1.2 Gripping force, finger speed and acceleration

The gripping force can be set in Newtons. A gripping force adapted to the respective gripping situation should always be selected. If the gripping force is set too high, this leads to increased wear of the gripping mechanism and unnecessary heat generation. If the selected gripping force is too low, in the worst case it will result in the loss of parts. When designing, take into account both static and dynamic forces acting on the gripped part, for example during movement by a robot.

The specified minimum gripping force of the gripping module indicates the gripping force at which reliable gripped part detection is guaranteed, even across batches. It is technically possible to set lower gripping forces on the gripping module. In this case, however, preliminary tests are absolutely necessary and the tolerance range must be taken into account. Gripping forces lower than the specified minimum gripping force can cause the finger movement to falter during gripping and the gripped part can no longer be reliably detected.

The gripping parameters can be used to set the finger speed and acceleration. The web interface provides a parameter editor (see chapter 8.3) with which these values can be optimally calculated depending on the selected gripping force. This minimizes the gripping impulse and rebound effects of an undamped grip.

Gripping forces below the specified minimum gripping force can lead to unexpected behavior. Take batch variations into account.

Excessive gripping speeds/accelerations that are not adapted to the gripped part may lead to an increased gripping impulse, which can damage the gripped part and gripping mechanism.

5.1.3 Permissible finger loads

The following table shows the permissible static loads on the base jaw guide.

Load	Load unit	INTRAPAL 1200-280
C_0	N	19 000
T_X	Nm	50
T_Y	Nm	120
T_Z	Nm	100

Table 4: Base jaw loads

In the case of superimposed forces and moments, the load carrying capacity of the guide must be recalculated according to the following equation:

$$\frac{M_x}{T_x} + \frac{M_y}{T_y} + \frac{M_z}{T_z} + \frac{F_z}{C_0} \leq 1{,}0$$

Here, C_0 and *T are* the permissible guide loads according to Table 4 and *M* is the sum of all moments occurring per base jaw (gripper, weight, inertia and process forces) in the application.

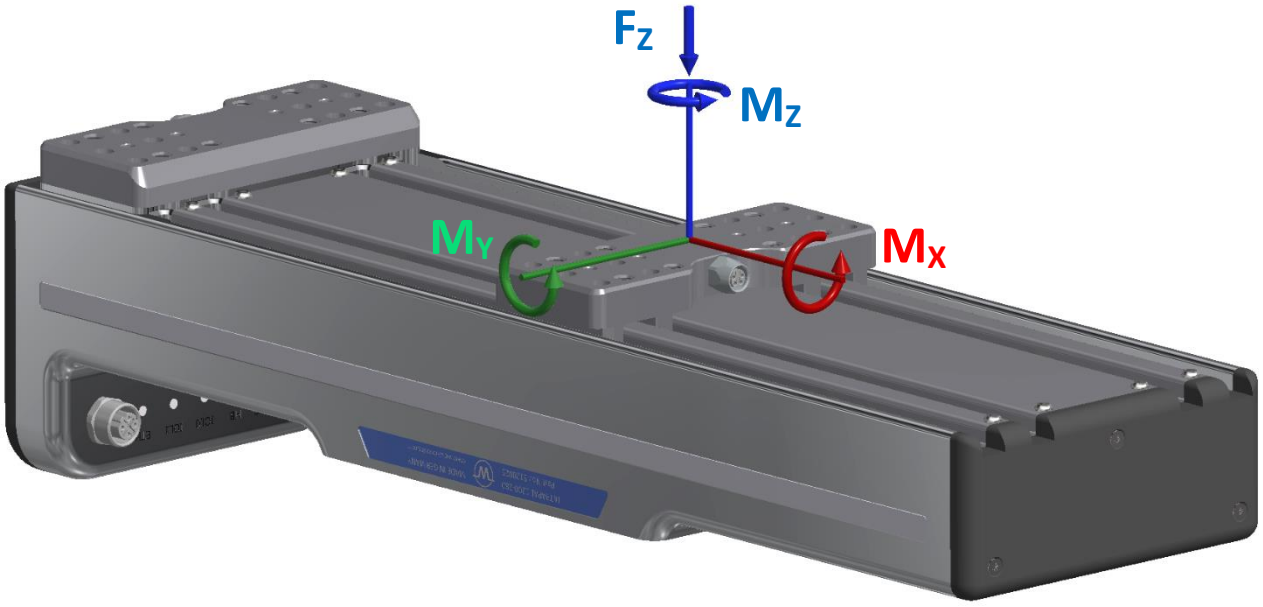


Figure 3: Base jaw loads

5.2 Nominal electrical data

The gripping module may be damaged if the specified nominal data is exceeded.
If in doubt, clarify your application with our technical sales department.

Safety extra-low voltage (SELV) is recommended for operating the gripping module.

Electrical operating data	Unit	INTRAPAL 1200-280
Supply voltage	V	24± 10%
Max. residual ripple of the supply voltage	mV_{SS}	150
Typ. current consumption (IDLE state)	A	0,37
Typ. current consumption (holding at nominal gripping force)	A	1,0
Max. current consumption (peak current while moving)	A	4,6
Recommended min. rated output current of the power supply unit	A	5

Monitoring unit	Unit	INTRAPAL 1200-280
Undertemperature warning level	°C	0

Overtemperature warning level	°C	55
Overtemperature error level	°C	75

Communication	Unit	INTRAPAL 1200-280
Standard	-	IEEE 802.3
Transmission speed	Mbit/s	10, 100
Protocol	-	Ethernet TCP/IP, Modbus RTU (RS485)

Table 5: Nominal electrical data

The typical current consumption (continuous current) during gripping is determined by the gripping force. The peak current in addition depends on the stiffness of the fingers and the gripped part. Figure 4 (Gripping) shows this example when gripped workpieces made of steel and ductile plastic.
When releasing, the typical current consumption depends mainly on the finger speed, while the peak current is also influenced by the acceleration and mass of the fingers (Figure 4, Release).

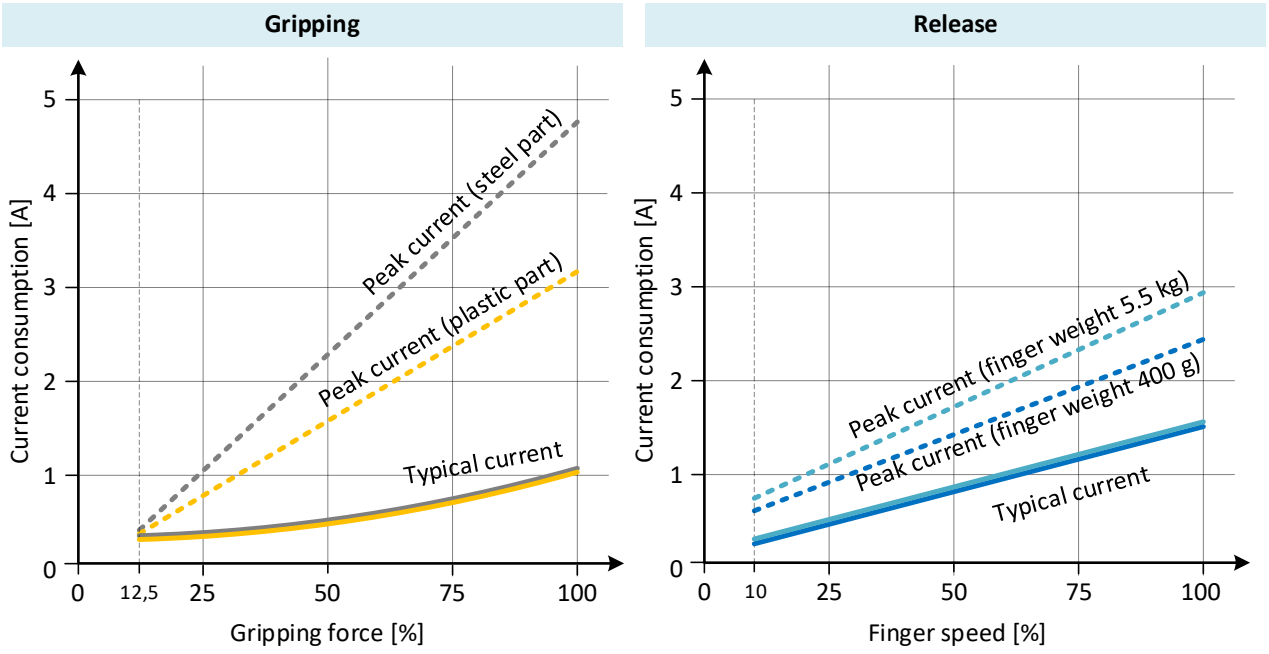


Figure 4: Current consumption of the gripping module during gripping and releasing

To reduce the peak current during gripping, presets with reduced gripping speed can be used (see Figure 5). This can be done either by directly specifying the value of the Gripping Speed parameter or indirectly by changing the override factor (see Chapter 8.3).

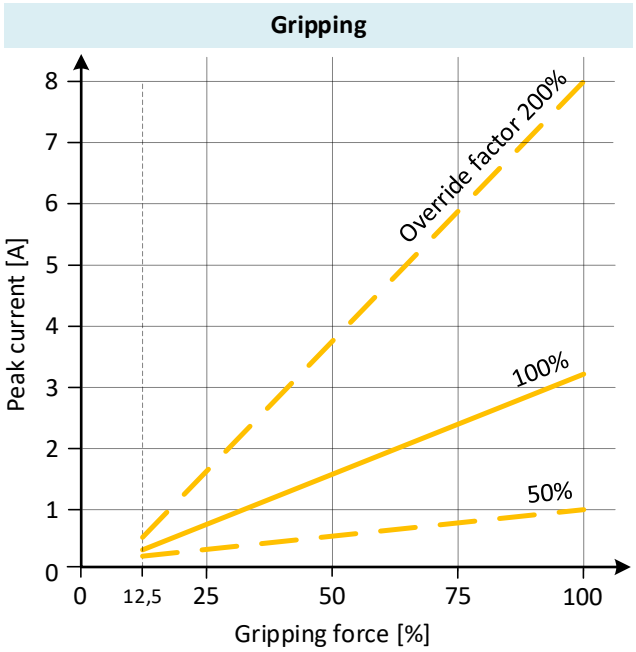
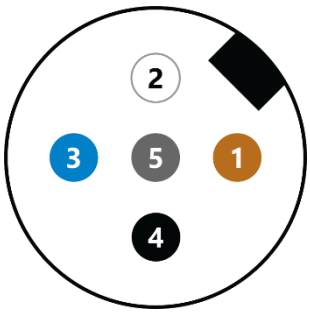


Figure 5: Peak current consumption when gripping plastic parts with different override factors

5.2.1 Power supply connection

Power is supplied via a five-pin M12A connector (plug) on the housing of the module (see Figure 1), via which the RS485 interface is also accessible. The pin assignment is shown in Figure 6.

The RS485 interface is terminated in the gripping module with 120 Ω.



Pin	Wire color	Signal	Function
1	Brown	VDRIVE	Power supply drive +24 V
2	White	VLOGIC	Power supply logic +24 V
3	Blue	GND	Ground 0 V
4	Black	RS485-A	Modbus interface, pin A (+)
5	Gray	RS485-B	Modbus interface, pin B (-)

Figure 6: Power supply connection terminal (view of connector)

Use shielded cables if the product is operated in an electromagnetically disturbed environment, e.g. in the vicinity of large electrical drives.

Safe Torque Off (STO)

Both the power and logic sections of the integrated gripper control are supplied via the M12 connector (see equivalent circuit diagram in Figure 7).

The power and logic sections can be supplied with power together (see Figure 8). If the application requires a separate power supply for the power and logic sections, for example to implement a safe torque off (STO) with an external safety relay, the power and logic sections can also be supplied with power separately. This is shown in Figure 9. The power and logic supply are not electrically isolated and must therefore be supplied via the same power supply unit.

In case of separate operation, always connect load and logic at the same supply! Damage to the gripping module possible.

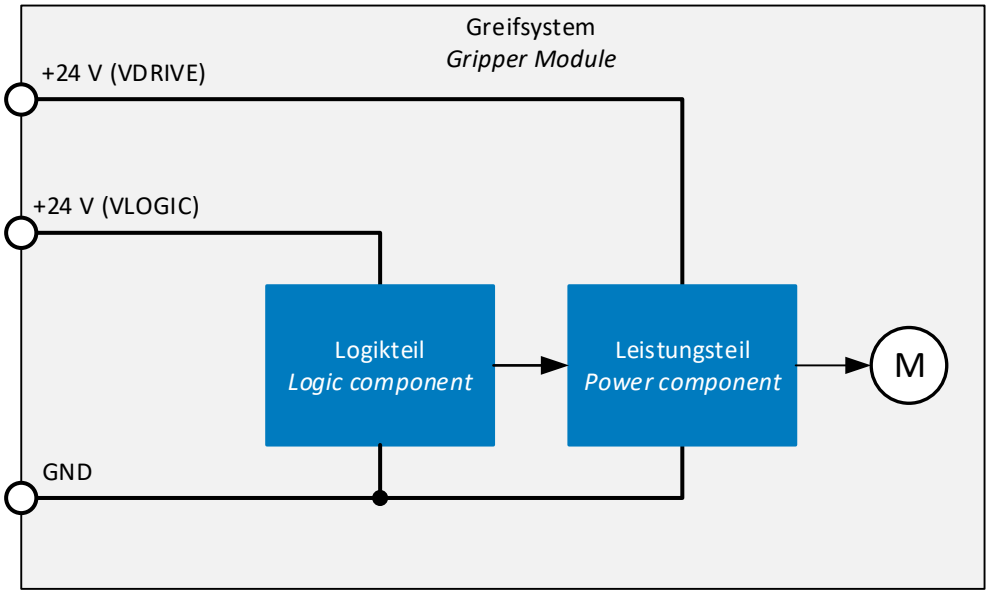


Figure 7: Internal structure of the power supply

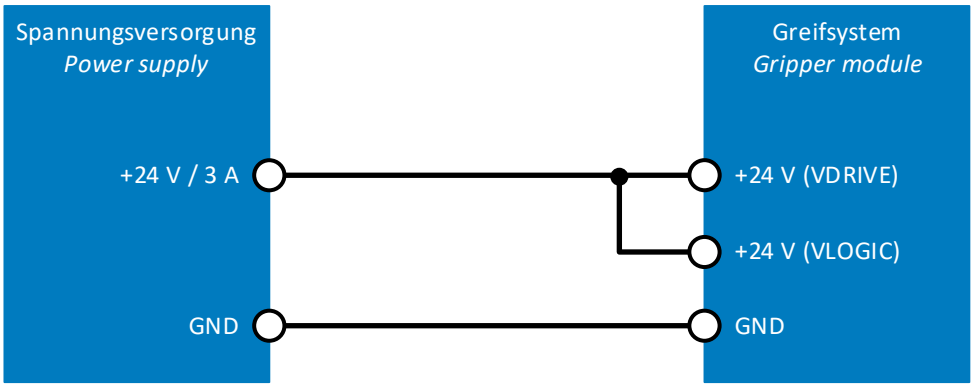


Figure 8: Common power supply for logic and power section

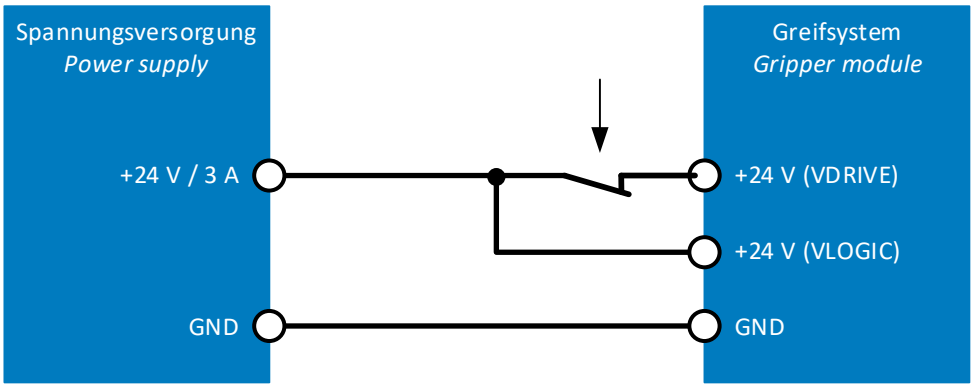
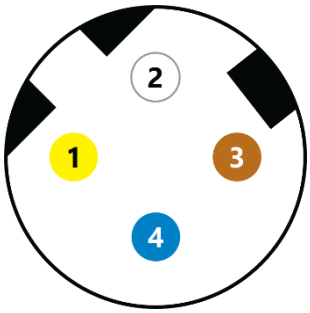


Figure 9: Separate power supply for logic and power section with STO function

5.2.2 Ethernet connection

The connection to an Ethernet network is also made via a four-pin M12D connector (socket) on the housing of the module (see Figure 1). The pin assignment is shown in Figure 10 and corresponds to the EtherCAT standard.



Pin	Wire color	Signal	Signal Function
1	Yellow	TX+	Ethernet TX
2	White	RX+	Ethernet RX
3	Orange	TX-	Ethernet TX
4	Blue	RX-	Ethernet RX

Figure 10: Ethernet connection terminal (view on socket)

6 Installation and commissioning

Risk of injury if the machine/system moves unexpectedly. Therefore, switch off the power supply during all work on the gripping module and ensure that there is no force!

Risk of injury from falling objects. Wear personal protective equipment!

6.1 Mounting the gripping module

Refer to the technical drawing for the dimensions of the threads and centering holes that can be used to mount the gripping module.

The gripping module can be mounted from below against a surface (Figure 11). The dowel pins (1) must be used for mounting and are included in the gripping module accessory pack.

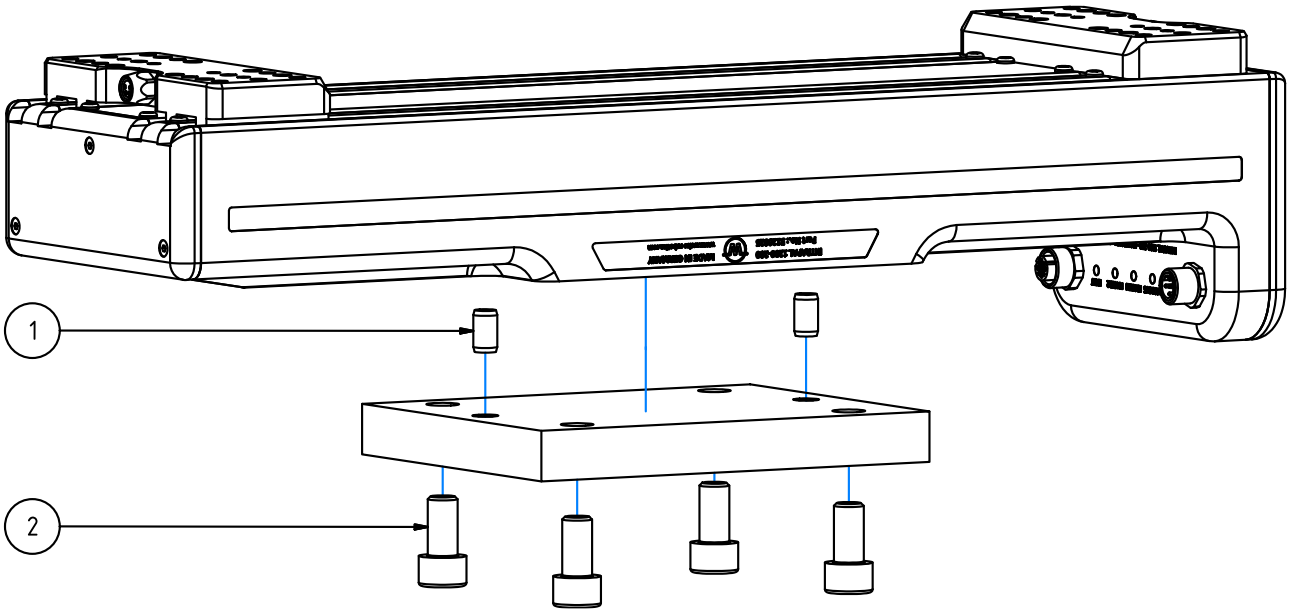


Figure 11: Mounting the gripping module

The assembly of the fingers is shown in Figure 12. The dowel pins must be used for assembly and are included in the gripping module accessory pack.

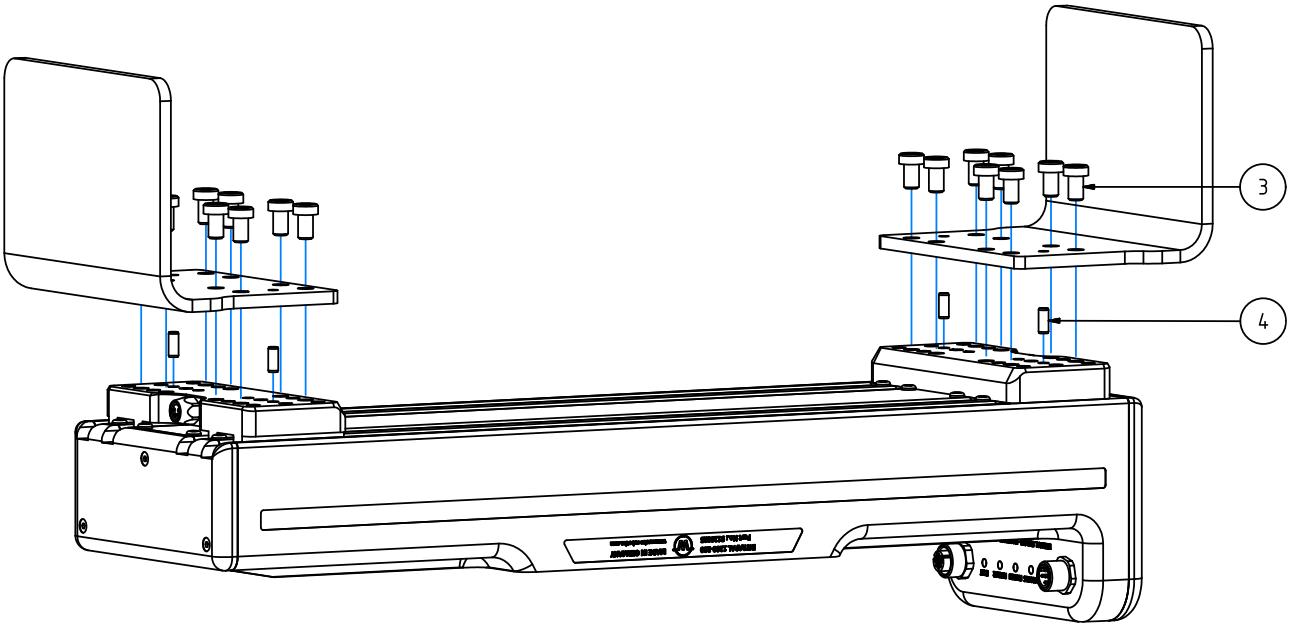


Figure 12: Mounting the fingers

The following table lists all the screws and centering pins recommended for assembly.

Position	INTRAPAL 1200-280
1	2 pieces Dowel pin ISO 2338 - 8 h8
2	4 pieces Screw, cylinder head (e.g. ISO 4762), M10 (min. screw-in depth 14 mm)
3	16 pieces Screw, cylinder head, if necessary with a low head (e.g. DIN 6912), M6 (min. 6 mm screw-in depth)
4	4 pieces Dowel pin ISO 2338 - 4 m6

Table 6: Screws and centering pins for assembly

7 Function of the gripping module

This gripper module is a servo-electrically driven one-finger gripper with an integrated gripper control, a particularly power-dense brushless drive and a high-resolution position measuring system. Movement and synchronization of the base jaw, which is guided by roller bearings, are carried out via a high-precision ball screw. The pre-positionability of the gripper fingers and the innovative gripping force control enable use in a wide range of different handling applications in various areas of industrial automation and intralogistics. Power supply and connection to the process controller are provided via two plug connectors (see section 5.2).
The integrated gripping control features highly optimized workpiece detection. Up to eight different workpieces can be parameterized and reliably gripped via the web interface or dynamically via the command interface. A position window is defined for each workpiece in which the grip must adjust itself. If the gripping module grips within this range, it changes from state RELEASED to HOLDING, which is the signal for a successful grip for the process control.
The gripping module continuously monitors the function-relevant components such as position sensors and drive and provides detailed diagnostic information via the command interface during operation. This serves to detect malfunctions.

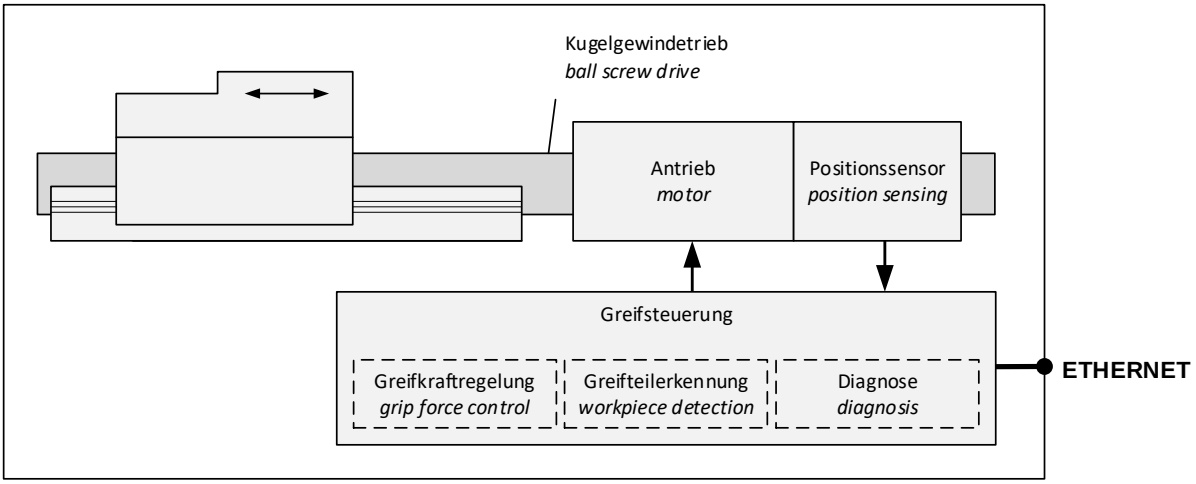


Figure 13: Functional diagram of the gripping module

Two LED strips on the both sides (Figure 14) and five LEDs (Figure 15) can be used to see at a glance the status of the gripping system (Table 7) and whether communication is taking place via the network interface (Table 8).

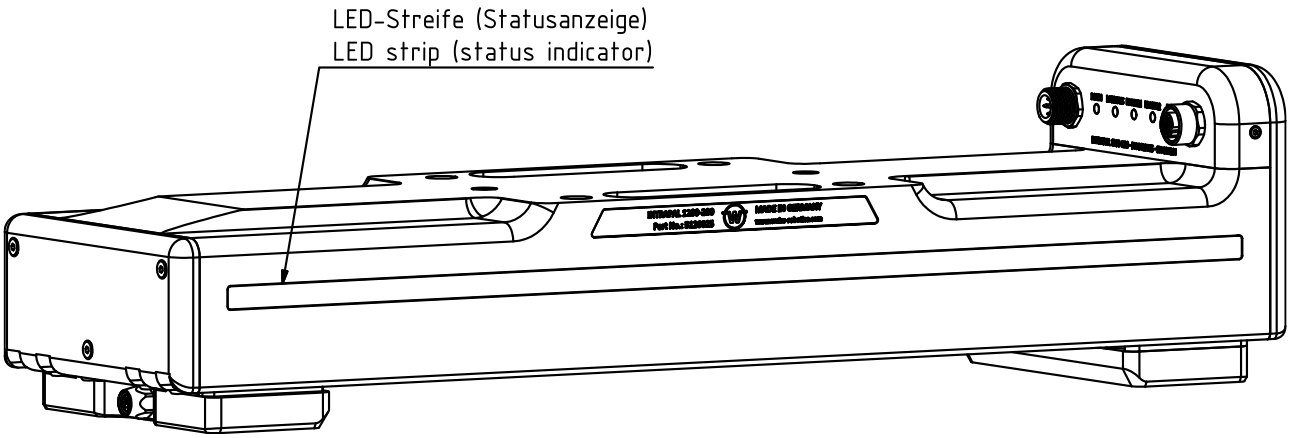


Figure 14: Status display via LED strips

Color of the LED strips	Meaning
Yellow running light	Gripping status NOT INITIALIZED and during referencing
White steady light	Gripping state DISABLED
Blue steady light	Gripping state RELEASED and OPERATING
Blue position indicator	Finger movement
Green steady light	Gripping state HOLDING
Yellow steady light	Gripping state NO PART
Red flashing	Gripping state FAULT
Red - green alternating	“Find me” mode active

Table 7: Display color of the LED strips and operating status

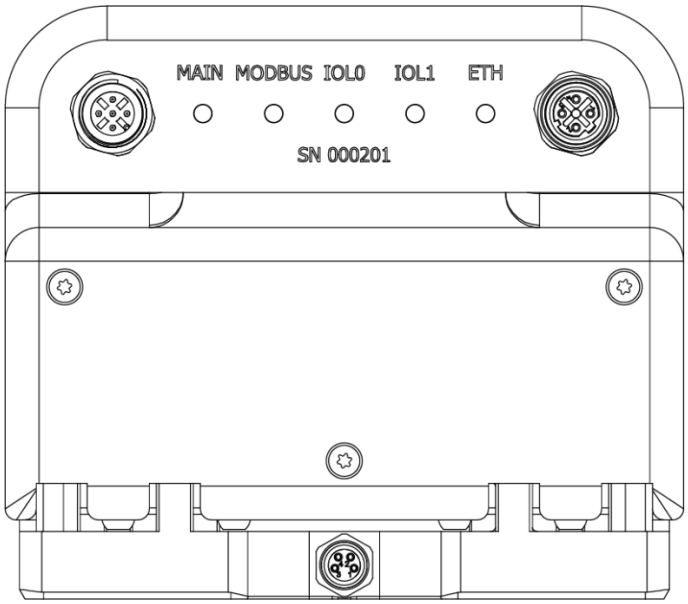


Figure 15: Status display via LEDs

LED	Status
MAIN	Green: Power ok Red: Error
MODBUS	*Modbus* Flashing green: Data transfer active Red: Protocol error
FINGER1	*Finger interface 1 (fixed finger)* See Table 9
FINGER2	*Finger interface 2 (moving finger)* See Table 9
ENET	*Ethernet interface* Green steady light: cable connected Flashing green: Data exchange

Table 8: Status display via LEDs

Display	Description
Flashing green	Connected device is being initialized
Green steady light	Connected device is ready for operation
Red steady light	No driver found for the connected device
Flashing red	Device driver error
Flashing red quickly	Port error (overtemperature, current consumption)

Table 9: LEDs of the finger interface

7.1 Non-volatile memory

The gripping module has a non-volatile memory in which the following information is stored:

- Device-specific factory adjustment
- Parameterization of the gripping module
- Log memory

8 Configuration and monitoring via the web interface

The web interface can be opened with a PC, tablet or similar via a web browser. To do this, enter the IP address or the mDNS URL of the gripping module in the address bar of the web browser. Network configuration of the gripping module as supplied: IP address: **192.168.1.40**, subnet: **255.255.255.0**

Not all browsers (e.g. Internet Explorer) are supported. We recommend the use of Google Chrome or Mozilla Firefox.

The mDNS URL of a gripping module consists of the type designation and its six-digit serial number (leading zeros). Example for S/N 123: http://intrapal-000123.local/

8.1 Device overview

The device overview shows the parameters of the gripping system and the connected peripheral devices.

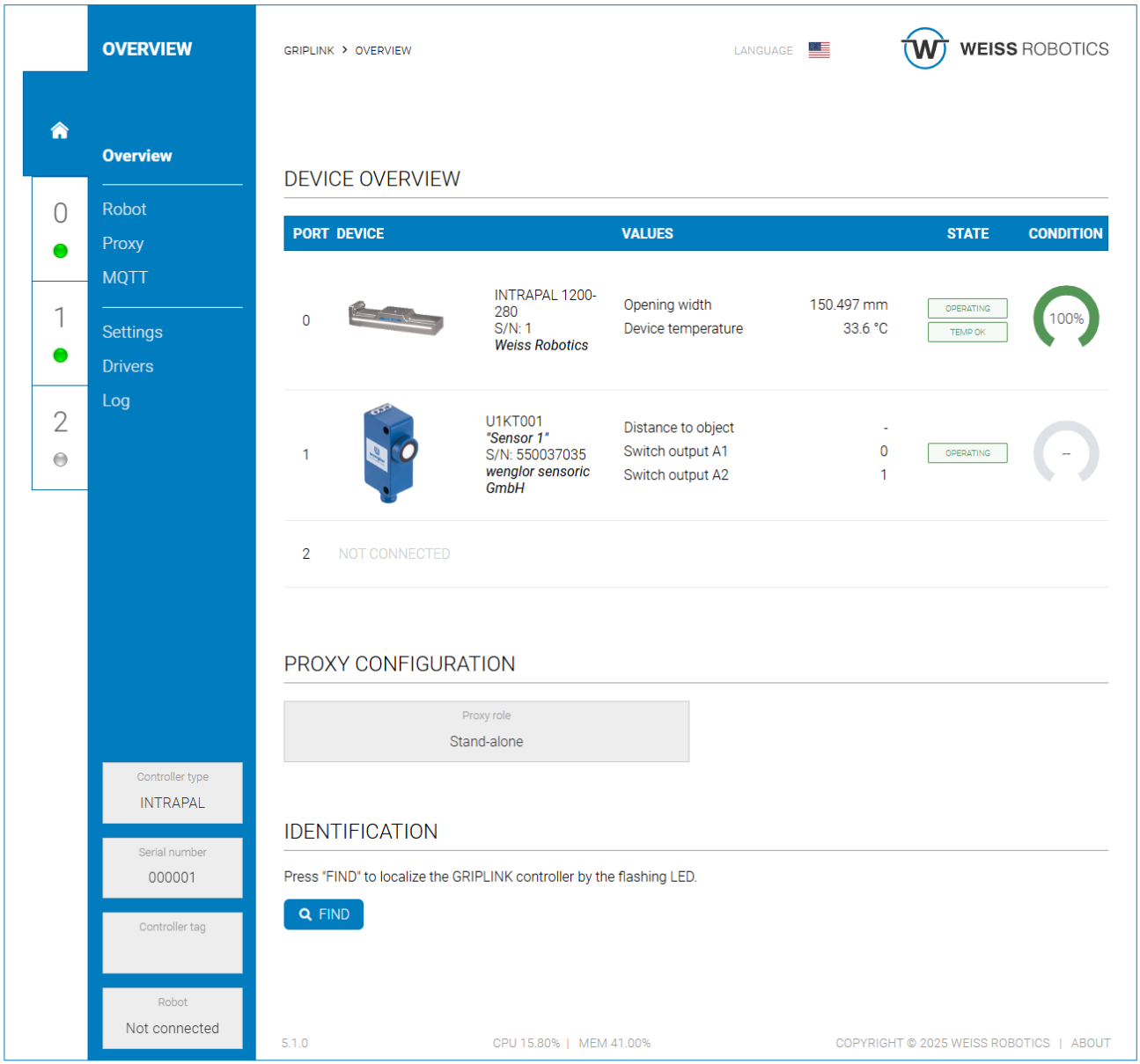


Figure 16: Device overview

8.2 Status overview

The most important parameters of the gripping system for monitoring are displayed in the status overview. These include gripping status, opening width of the base jaws, device temperature and supply voltage.
The control panel can be folded out using the blue tab on the right-hand edge of the window (see chapter 8.4).

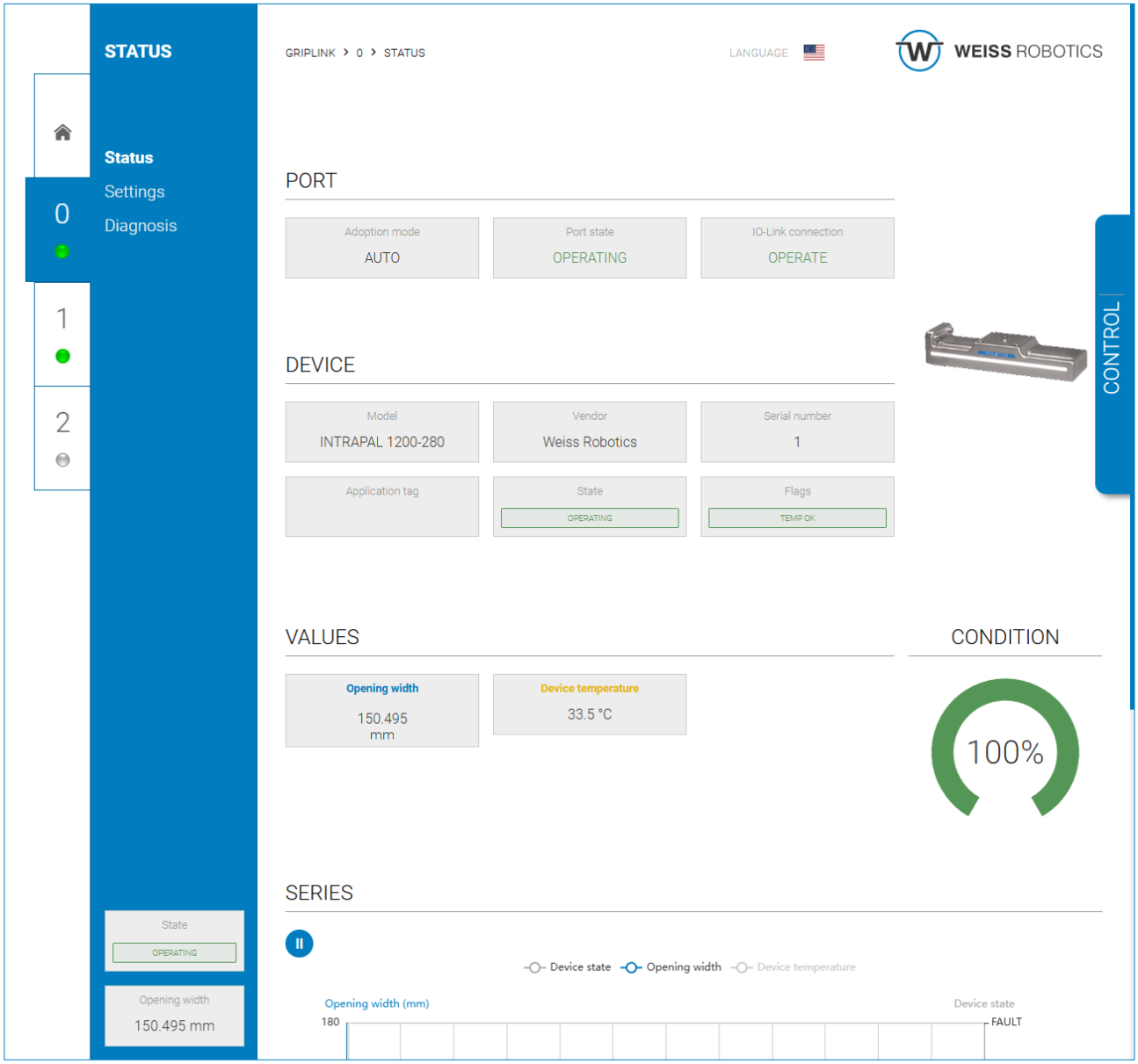


Figure 17: Status overview

8.3 Grip parameter configuration

Up to eight Grip presets (“Recipes”) can be configured in the “Basic Settings” menu. These are displayed in a table form. In addition, two override factors (“Override for gripping speed” and “Override for release speed”) can be configured in this menu (Figure 18).

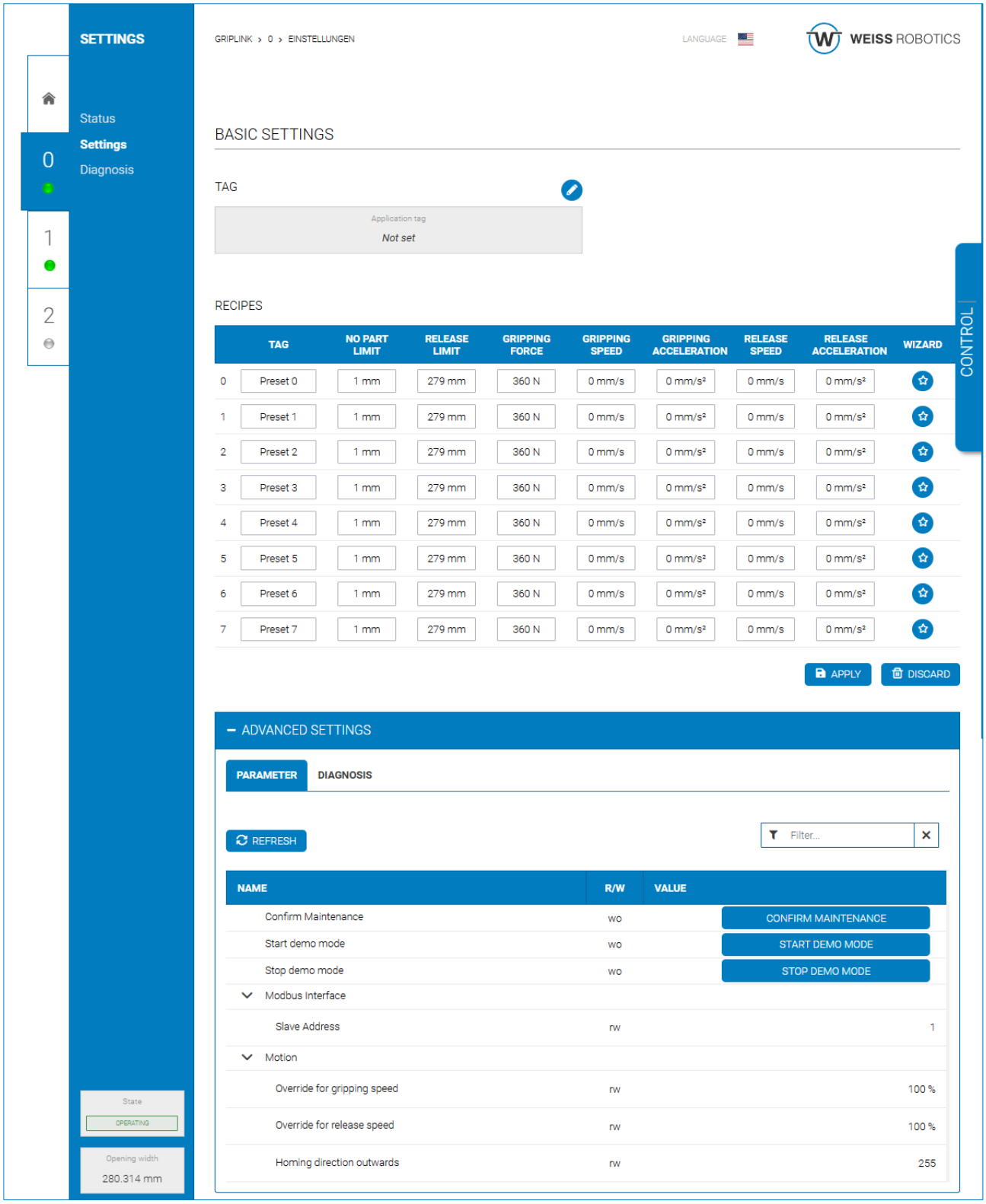


Figure 18: Overview of the grip presets and Override factors

8.3.1 Parameter of the Grip presets

The current section describes the parameters of the gripper presets. The limit values of the parameters are shown in Table 10. Two application examples with step-by-step selection of the gripping parameters are shown in Section 11.9.

Parameter	Minimum value	Maximum value	Default value	Unit	Comment
NO PART-LIMIT	-282	282	10	mm	Required parameter
RELEASE-LIMIT	-282	282	272	mm	Required parameter
GRIPPING FORCE	150	1200	300	N	User value is clamped to the permissible value range.
GRIPPING SPEED	5	190	*	mm/s	If the gripping speed is set to 0 mm/s, the gripper automatically calculates the speed that matches the set gripping force.
GRIPPING ACCELERATION	100	1500	1500	mm/s²	If the gripping acceleration is set to 0 mm/s², the gripper uses the default value.
RELEASE SPEED	5	190	190	mm/s	If the release speed is set to 0 mm/s, the gripper uses the default value.
RELEASE ACCELERATION	100	3000	3000	mm/s²	If the release acceleration is set to 0 mm/s², the gripper uses the default value.

Table 10: Permissible value range of the grip preset parameters

NO PART-Limit, RELEASE-Limit

For parameterization, a position window is specified for each gripping preset by the limit values No Part Limit and RELEASE-Limit, within which the gripped part must be located. Further details on these parameters and on the gripping direction can be found in Section 11.5.

Gripping force

Force with which the workpiece is gripped. The gripping force corresponds to the effective holding force multiplied by the number of friction surfaces (two).

Gripping speed

Speed at which the fingers move toward the workpiece. The gripping speed is measured relative to the fingers.

Gripping acceleration

Acceleration of the fingers when approaching the workpiece.

Release speed

Finger speed when releasing the workpiece.

Release acceleration

Acceleration of the fingers when releasing the workpiece.

The values “0” may also be entered for the parameters Gripping speed, Gripping acceleration, Release speed, and Release acceleration (Figure 18). In this case, the gripping module uses the default value of the corresponding parameter (Table 10).

The “RELEASE limit” and “NO PART limit” parameters must be selected with a sufficient safety margin to their limit values. Gripping and releasing at the end stops must be avoided.

Three parameters of the grip presets must be specified for the gripping module to operate: NO PART-Limit, RELEASE-Limit, and gripping force. In some applications, it may also be necessary to change the other parameters: Gripping speed, Gripping acceleration, Release speed, and Release acceleration. Although these values can be entered directly in the Grip presets (“Recipes”), it is recommended to use the override factors instead.

8.3.2 Override factors

Override factors can be found in the “Advanced Settings” menu (Figure 18). Click on the corresponding value to change it. The limit values for the override factors are shown in Table 11.

Factor	Minimum value	Maximum value	Default value	Comment
Override for gripping speed	10 %	200 %	100 %	The limits of the gripping speed parameter cannot be exceeded and are clamped to the applicable limit value.
Override for release speed	10 %	100 %	100 %	The limits of the release speed parameter cannot be exceeded and are clamped to the applicable limit value.

Table 11: Permissible value range of the override factors

Override for gripping speed

An additional override factor that can be used to adjust the gripping speed automatically calculated from the gripping force. The override factor does not take effect if the gripping speed has been explicitly specified (gripping speed not equal to 0).

Override for release speed

An additional override factor that can be used to adjust the standard release speed. The override factor does not take effect if the release speed has been explicitly specified (release speed not equal to 0).

By reducing the corresponding override factors, the peak current during gripping (Figure 5) or releasing (Figure 4, Release) can be reduced.

8.3.3 Teach wizard

The button at the right-hand end of each line can be used to call up the teach wizard, which can be used to teach in gripping parts quickly and safely.

The first step is to ensure that the gripping module is referenced.

The gripping module is deactivated. Make absolutely sure that the gripping module is not holding a gripped part at this time and observe the warning messages displayed!

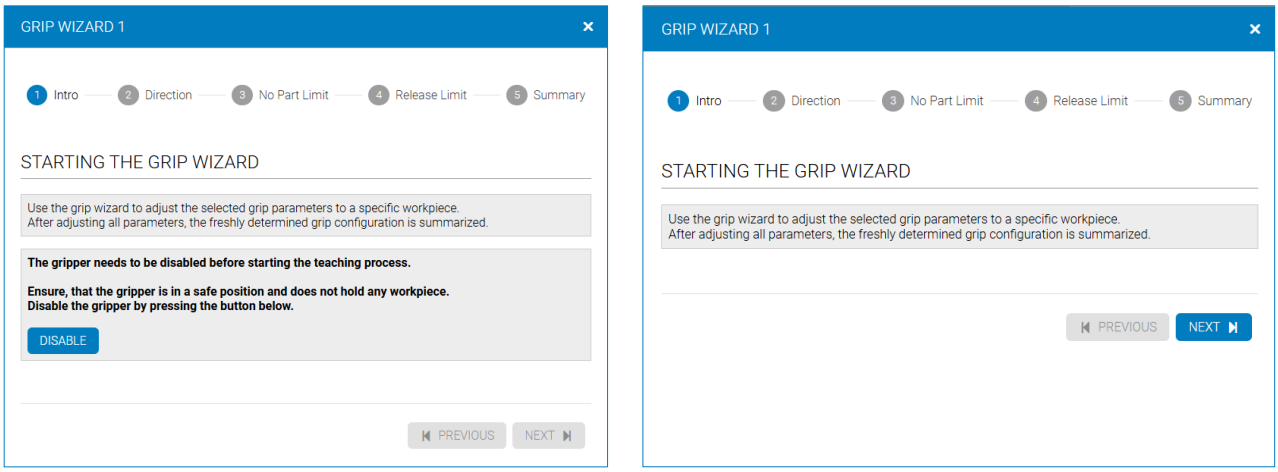


Figure 19: Gripping module is not ready for teach-in (left), gripping module is ready for teach-in (right)

In the second step, you define whether a workpiece is gripped from the inside or outside.

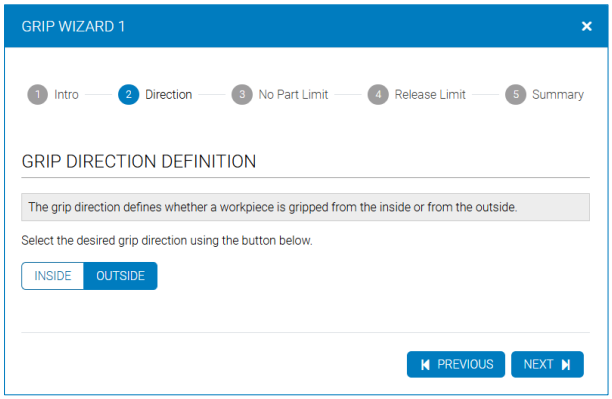


Figure 20: Definition of the gripping direction

The user then places the gripped part between the fingers of the gripping module so that the gripper touches the gripped part at the gripping points. The fingers are then moved by the user so that the gripper releases the gripped part. These steps are independent of whether the component is gripped from the outside or the inside.

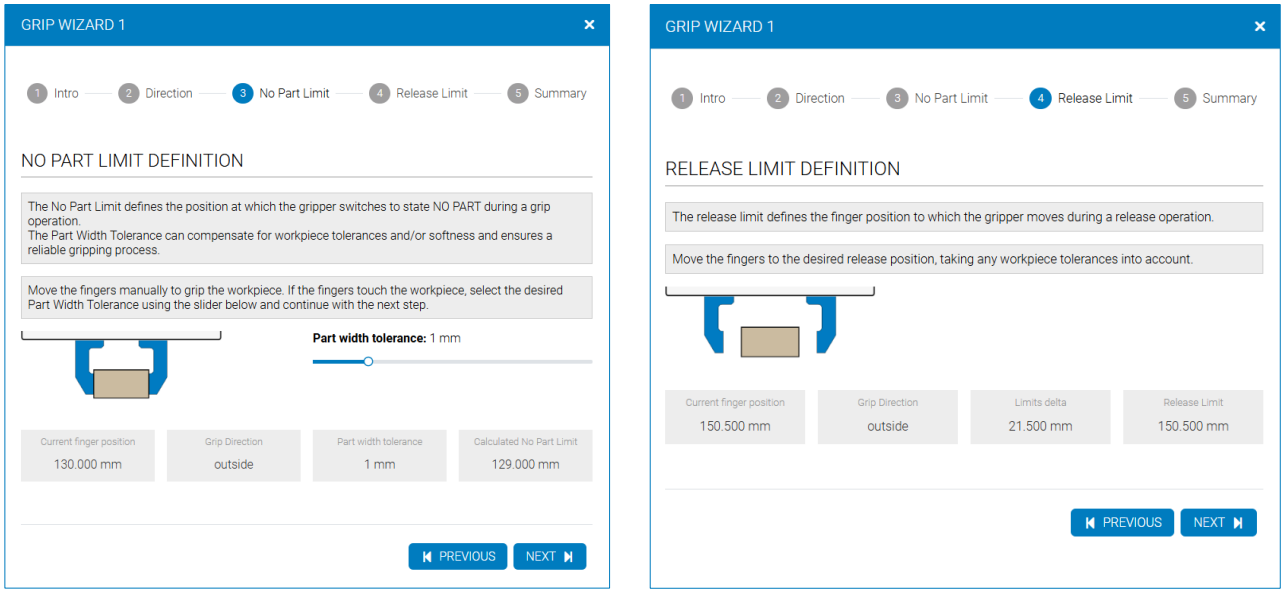


Figure 21: Teaching in the NO PART limit (left) and RELEASE limit (right)

The last step takes you to the summary, where you can confirm or fine-tune the taught-in values.

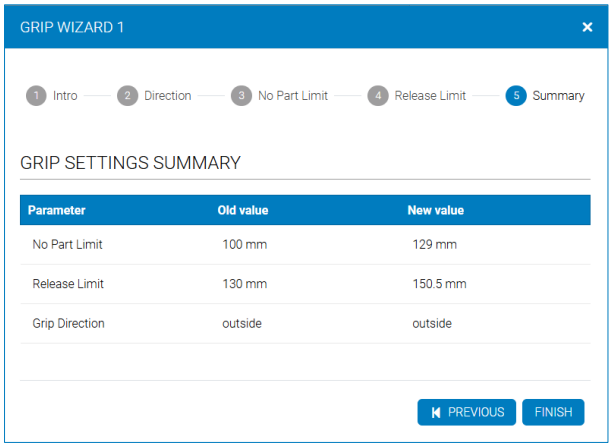


Figure 22: Summary of the handle settings

The taught-in values are only written to the gripping module after confirmation in the preset editor. For non-volatile storage of the parameters, follow the instructions in chapter 8.3.1.

8.4 Manual Control

A tab appears on the right-hand side of the web application. If this is clicked, a window opens in which the gripper can be controlled. In this window, grip and release commands can be executed with the configured grip presets.

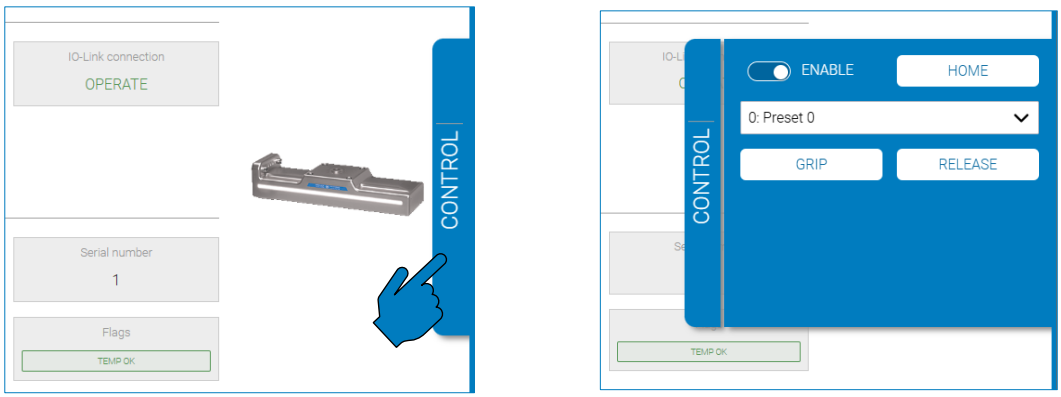


Figure 23: Control panel tab

The control panel is not available on all pages.

Be sure to keep the travel area of the fingers clear during the reference and release runs to avoid collisions and damage to the gripping module.

8.5 Settings

Basic settings for the gripping system can be made in the "Settings" menu. Licenses can be activated or de-activated in the service menu. The "Add" button can be used to enter the license key in the dialog that opens. Software updates can also be downloaded and installed, the device can be restarted or reset to the factory settings.

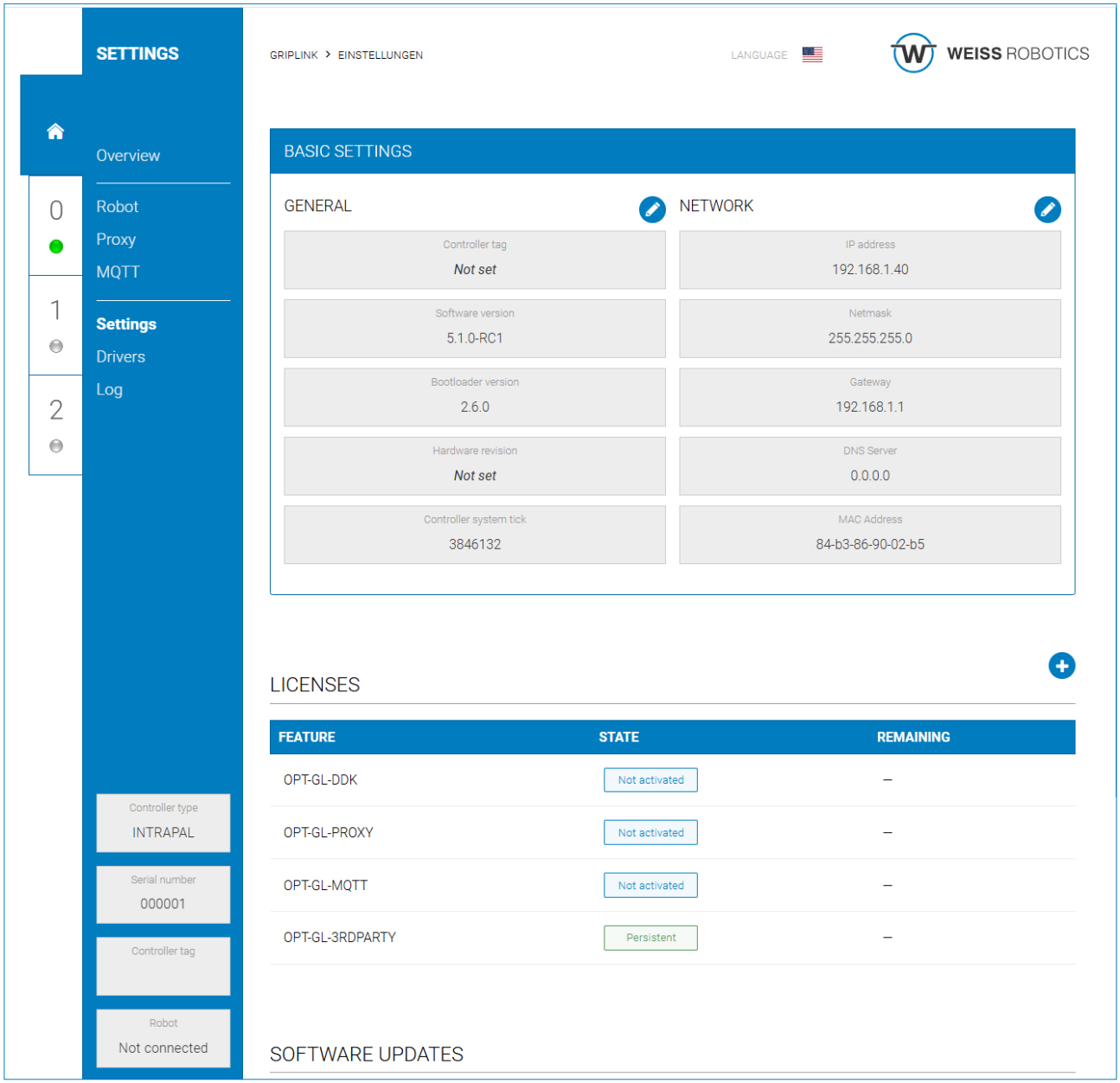


Figure 24: Settings for network, UI and licenses

When changes are made to the device-specific settings, values are only saved remanently when the "Save" button is pressed. Before that, the values are only transferred to the gripper temporarily.

8.6 Setting up a proxy network

In applications where more than one INTRAPAL gripping module is to be used, the optionally available proxy license (OPT-IPL-PROXY) can be used to set up a network of several INTRAPAL gripping modules, one of which acts as the master and forwards incoming commands from the higher-level controller to up to seven slaves. The master remains the sole point of contact for the robot controller, which greatly simplifies implementation in an existing system.
In combination with a GRIPLINK controller (e.g. GRIPLINK-ET4, part number 5020069), these gripping modules can also be linked with IO-Link-capable automation components and operated in the same application.

See also application note *an_griplink_proxy_en.pdf* (available for download on our website at **www.griplink.de**)

The proxy functionality is only available if the license is activated on the master device (OPT-IPL-PROXY). Contact our sales department at **sales@weiss-robotics.com** for more information.

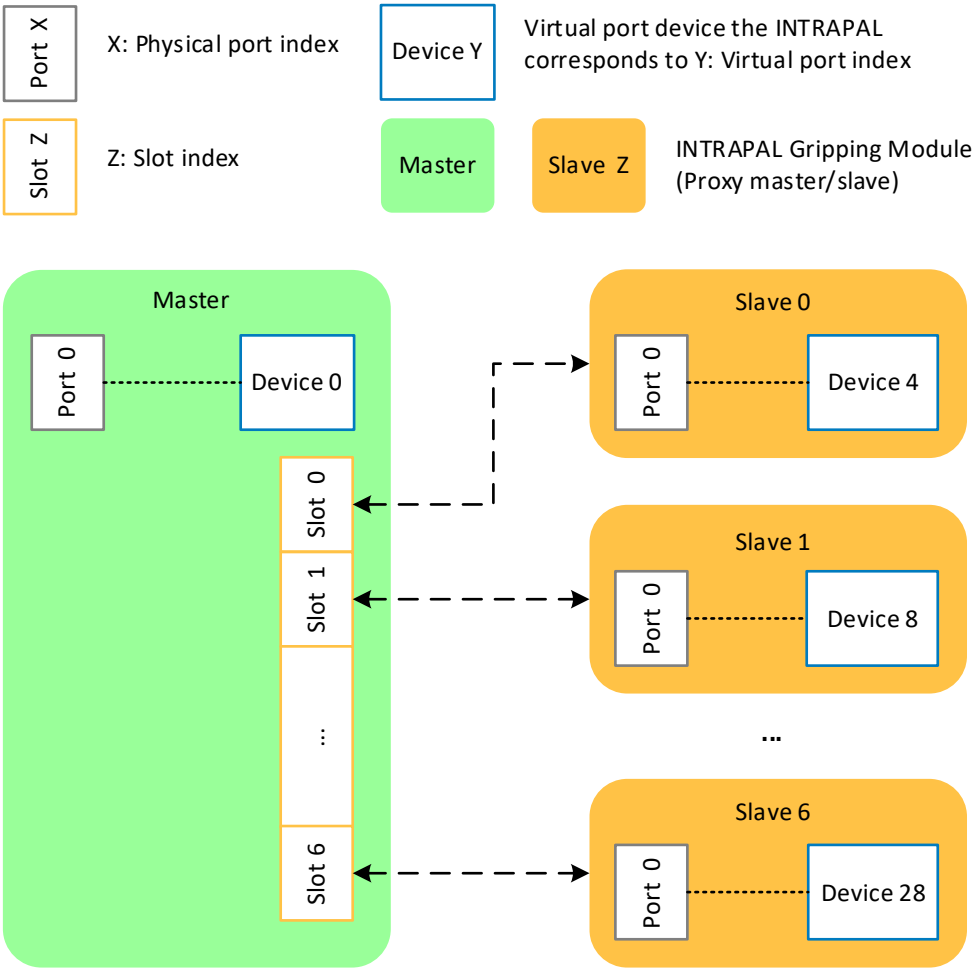


Figure 25: Simple proxy network consisting of several INTRAPAL gripping modules

8.7 Driver package management

Additional driver packages can be installed or uninstalled in the "Drivers → Driver manager" menu. The driver can be uploaded via the dialog that “Install" button opens.

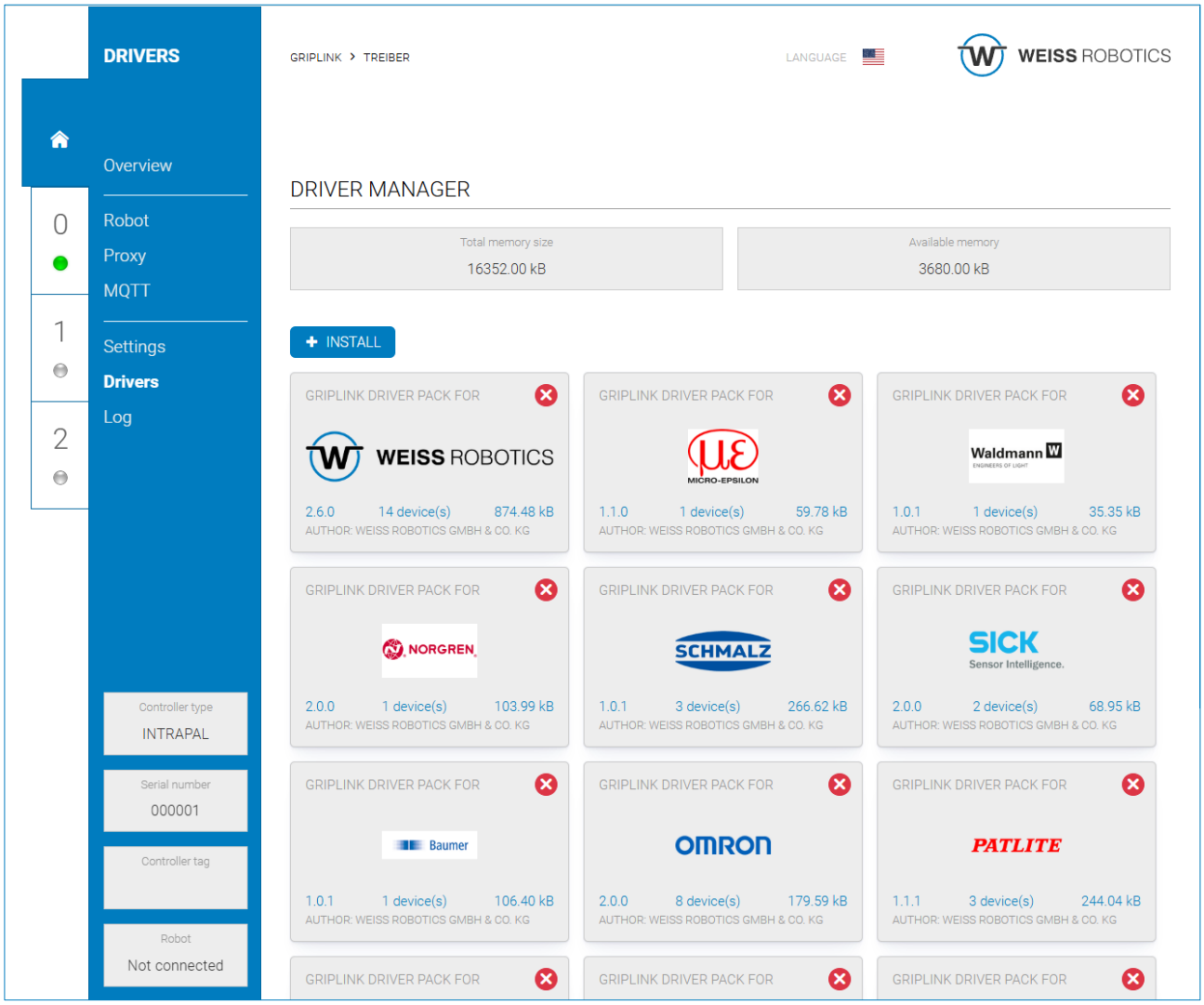


Figure 26: Driver package management

The "Weiss Robotics" driver package must be installed for the gripping module to function correctly.

After uploading, wait until the web interface displays the message that the installation is complete.

8.8 Event log

In the "Log → Event log" menu, logs can be displayed that were automatically created for various activities.

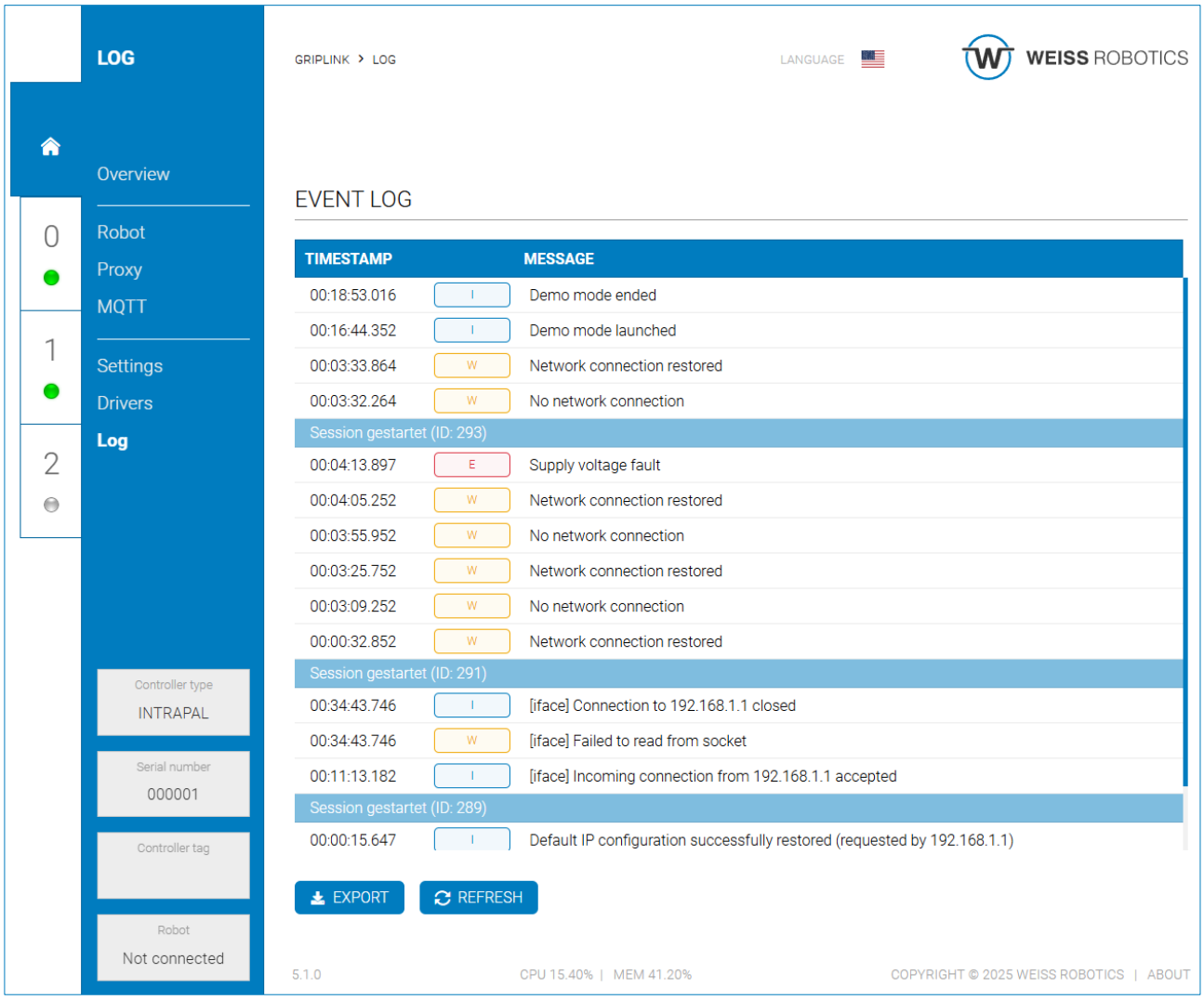


Figure 27: Event log

8.9 Firmware update

The firmware can be updated directly via the web interface.

Only update the firmware of the gripping module after prior consultation with Weiss Robotics technical support!

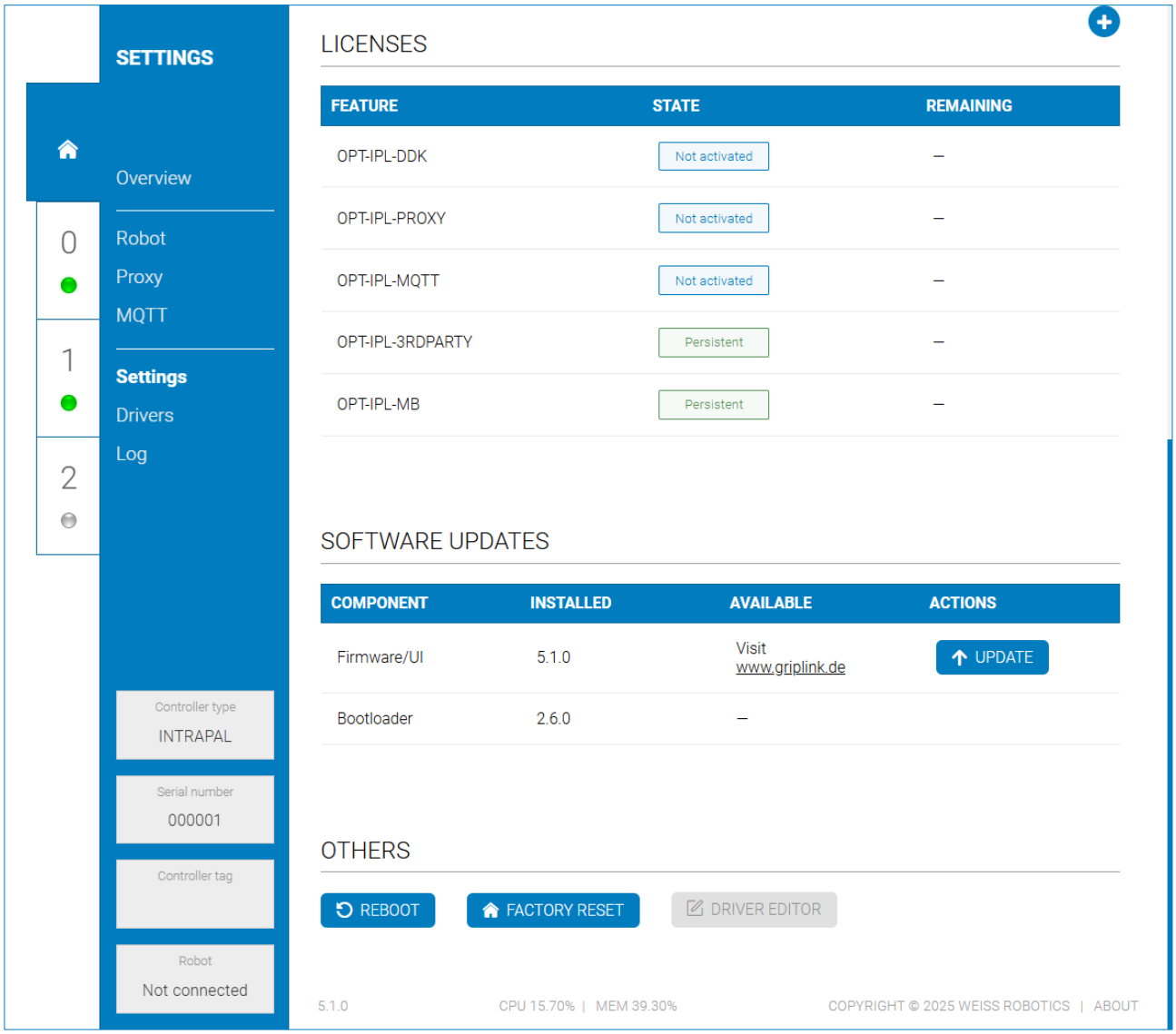


Figure 28: Firmware update

9 Factory reset

A factory reset, also known as a hard reset or master reset, restores a device to its original factory settings, effectively erasing all user data and settings. This is often done to resolve performance issues or prepare a device for disposal.

Remove the screw (1) and sealing washer (2) as shown in Figure 27 (View A). At the bottom of the opening is the factory reset button, which can be reached with a thin pin.

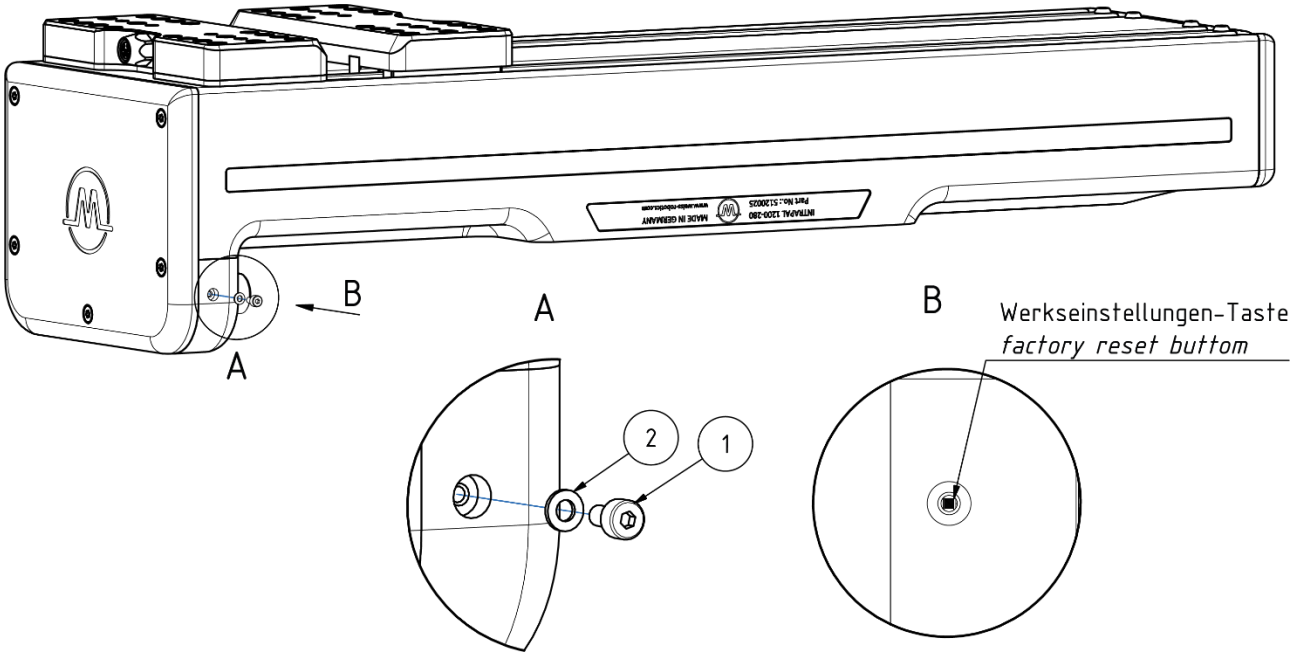


Figure 29: Factory reset

10 Interface description

The gripping module can be controlled both via Ethernet TCP/IP and with the optionally available technology package "OPT-IPL-MB" via Modbus RTU (RS485). Use our ready-made and certified plugins for this (Ethernet = GRIPLINK plugins, Modbus RTU = FLEXGRIP plugins).

You can find GRIPLINK plugins at **https://weiss-robotics.com/griplink-technology/platforms/**

Please note that the optionally available technology package "OPT-IPL-MB" is required for operation.

Alternatively, you can also control the gripping module directly from your application via the Unified Command Set using Ethernet TCP/IP.

You can find the Unified Command Set command reference at **www.weiss-robotics.com/intrapal/#downloads**

11 Controlling the gripping module

11.1 Gripping state

The gripping module is always in a defined gripping state. This is generated by the integrated gripping part recognition. It can be used to control the sequence of the handling process. Table 12 lists the possible gripping states.

State	State Description
IDLE	**Gripper in idle mode** The gripping module is inactive and the fingers are deactivated.
ENABLED	**Gripper in active mode** The gripper module is active and holds the current position of the base jaws without a grip/release command being executed. The base jaws remain in this position.
RELEASED	**Part released** The gripping part is released, i.e. the parameterized RELEASE LIMIT has been reached. The base jaws remain in this position in a position-controlled manner.

NO PART	**No part gripped** No gripped part was detected during gripping, i.e. the parameterized NO PART limit was reached. The base jaws remain in this position in a position-controlled manner.
HOLDING	**Part is being held** The gripping module has blocked between the parameterized NO PART and RELEASE LIMITS and the base jaws do not move. The gripped part is held with the set force, the gripped part monitoring is activated.
FAULT	**An error has occurred** An internal error has occurred that prevents the gripping module from functioning correctly.

Table 12: Gripping states

The possible transitions between the states are shown in Figure 30.

A change of state is initiated by the gripping commands GRIP/RELEASE and ENABLE/DISABLE. If the gripping module receives a new command, it is executed and then, depending on the result, the gripper state is updated accordingly. During the process, each of these commands leads to a change of state, so that the completion of a command can be recognized by waiting for a change of state.

The gripper state thus provides a simple way of mapping the gripping process into the higher-level controller. After a new gripping command has been triggered, it is only necessary to wait for the gripping state to change in order to detect whether the command has been executed correctly or not and to execute the next process step depending on this transition.

The HOME command (reference travel) does not lead to a change of state. The command is blocking and the higher-level controller receives a feedback as soon as the reference run has been completed or aborted in case of an error.

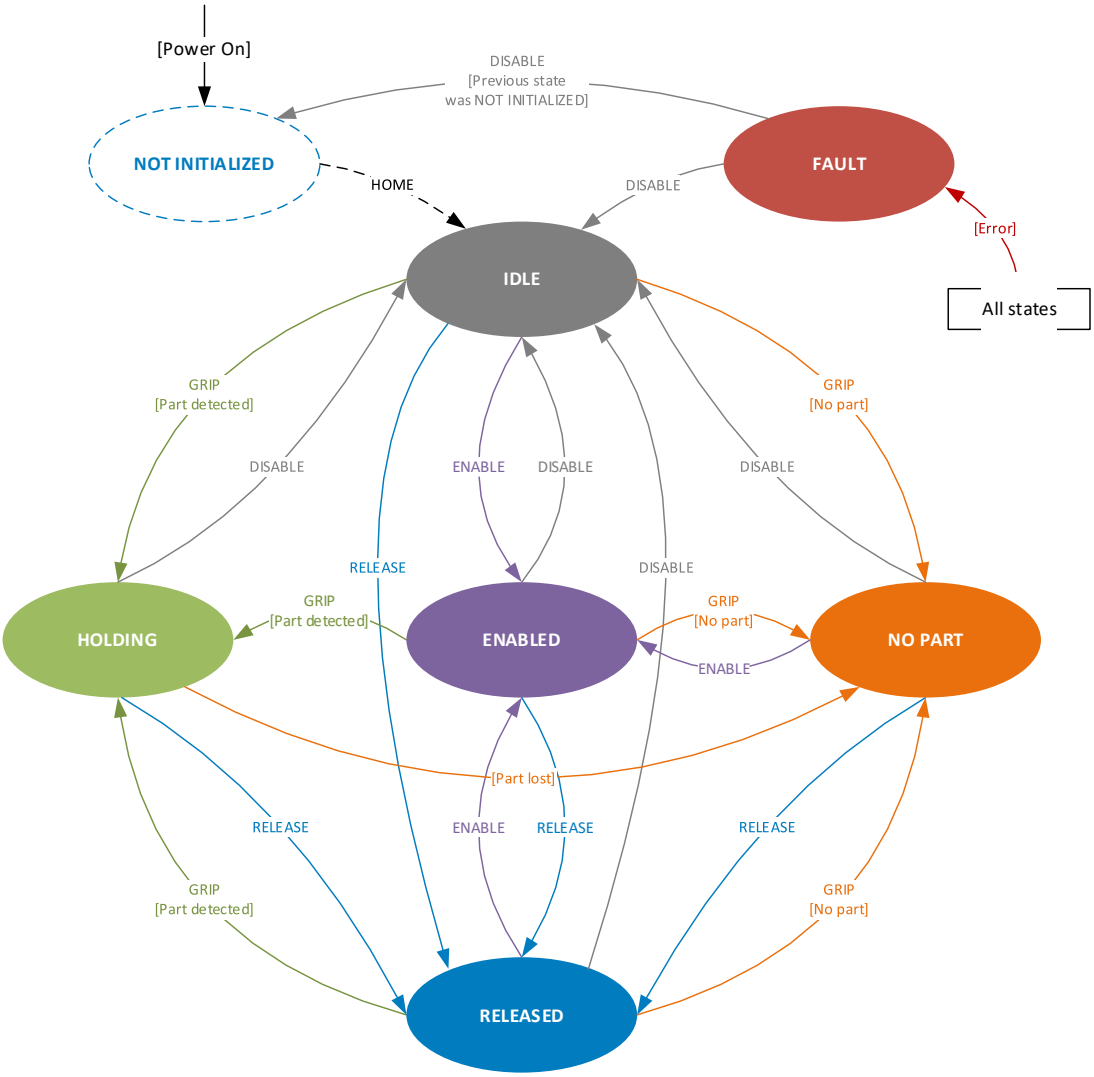


Figure 30: State transitions

11.2 Position sensors

The gripping module has an integrated position measuring system that measures the position of the base jaws with high precision. The position value corresponds to the distance between the two base jaws minus a safety distance of 25 mm, whereby the inner stop corresponds to the distance 25 mm. Figure 31 shows the relationship between the position value of the sensor and the real position of the base jaws.

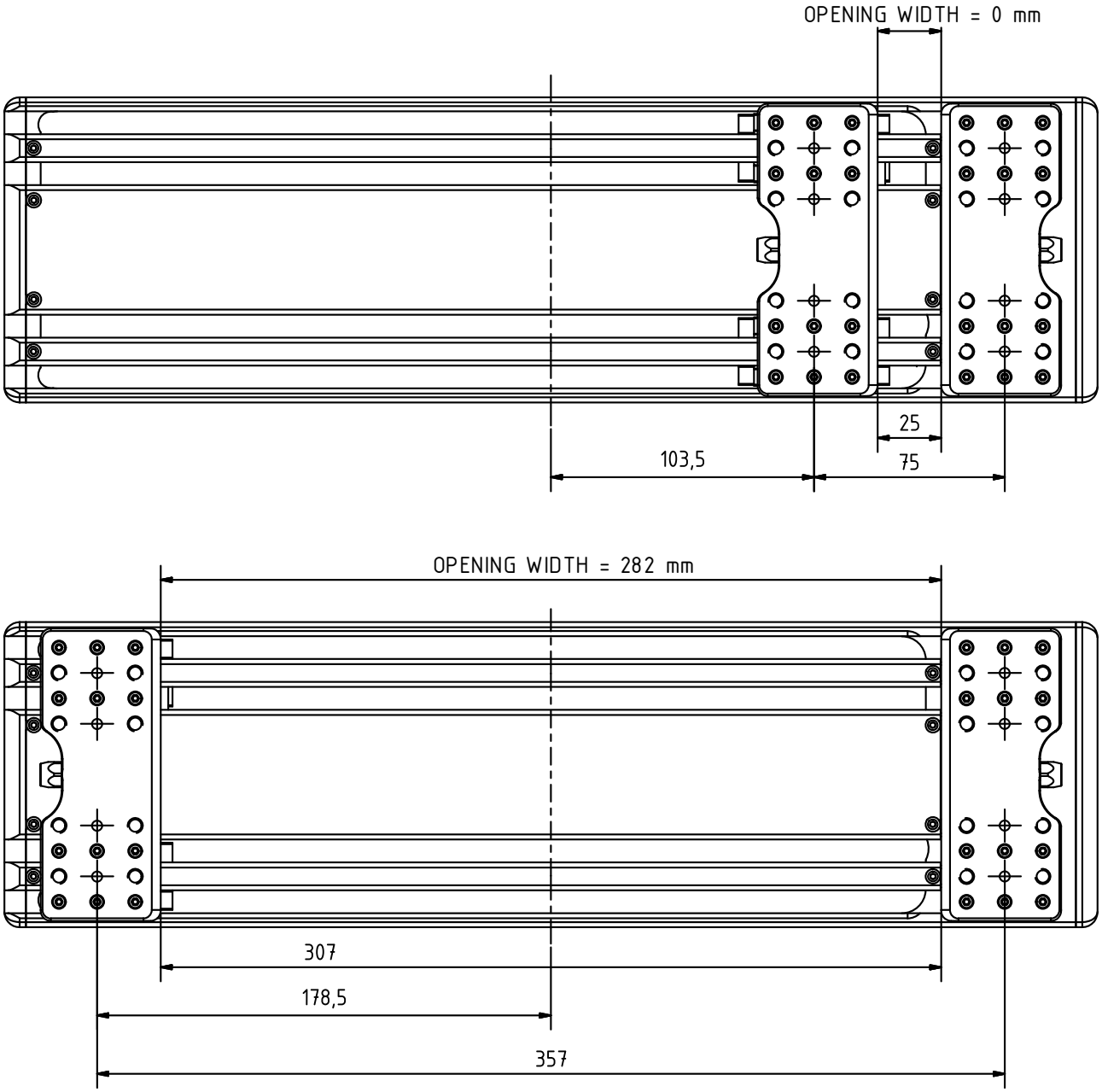


Figure 31: Position values

11.3 Reference run

When the gripping module is switched on, the finger position is initially unknown due to the relative position measuring system used. Before the gripping module can execute movement commands, it must be referenced. To do this, the gripping module moves the base jaws to the outer stop with a defined force and speed and uses this position as a reference value from then on. The program sequence is shown in Figure 32 .

During the reference run, keep the travel range of the fingers clear to avoid collisions and incorrect referencing.

If referencing to the outside is not possible due to the application, e.g. because a collision with the gripped part or environment would occur, the homing direction can be configured via the web interface (see section 8.5). Please note that the total stroke may deviate from its nominal value due to mechanical tolerances. This means that, even with the same position specification, the positions of the basic jaws may differ depending on the direction of the reference run performed beforehand.

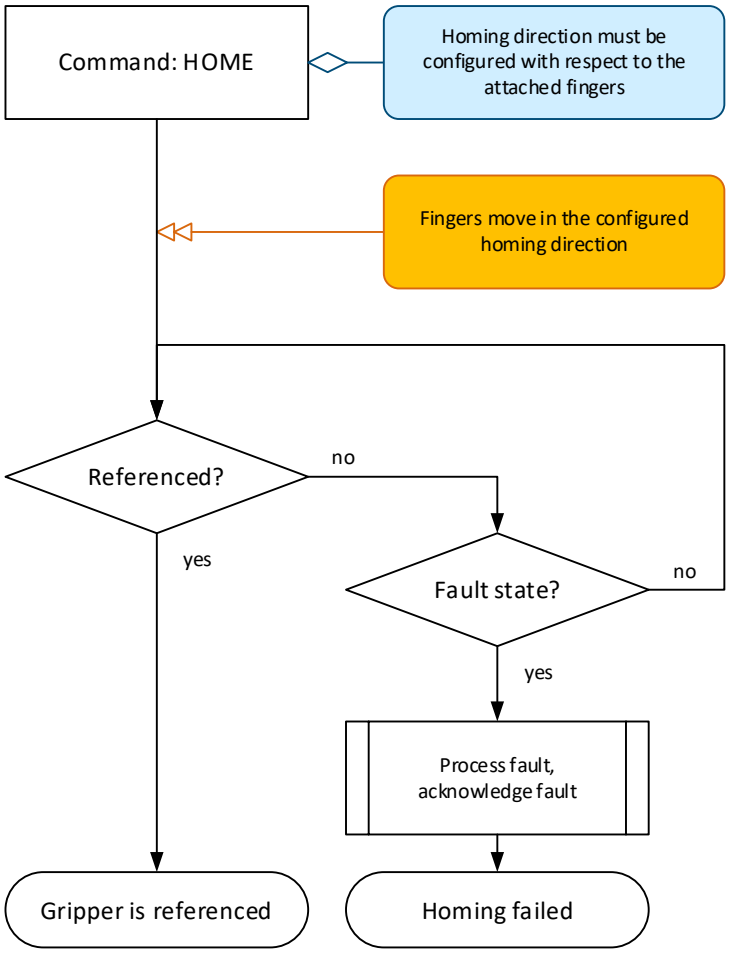


Figure 32: Referencing program sequence

11.4 Enable and disable

The gripping module can be activated (enabled) and deactivated (disabled). The base jaws do not move. If the gripping module is deactivated, the drive is de-energized and the base jaws can be moved manually.

Part loss possible! Never deactivate the gripper module when a workpiece has been gripped!

Move the base jaws as close as possible to the gripping module and not at the end of the mounted fingers. Damage to the gripping module possible!

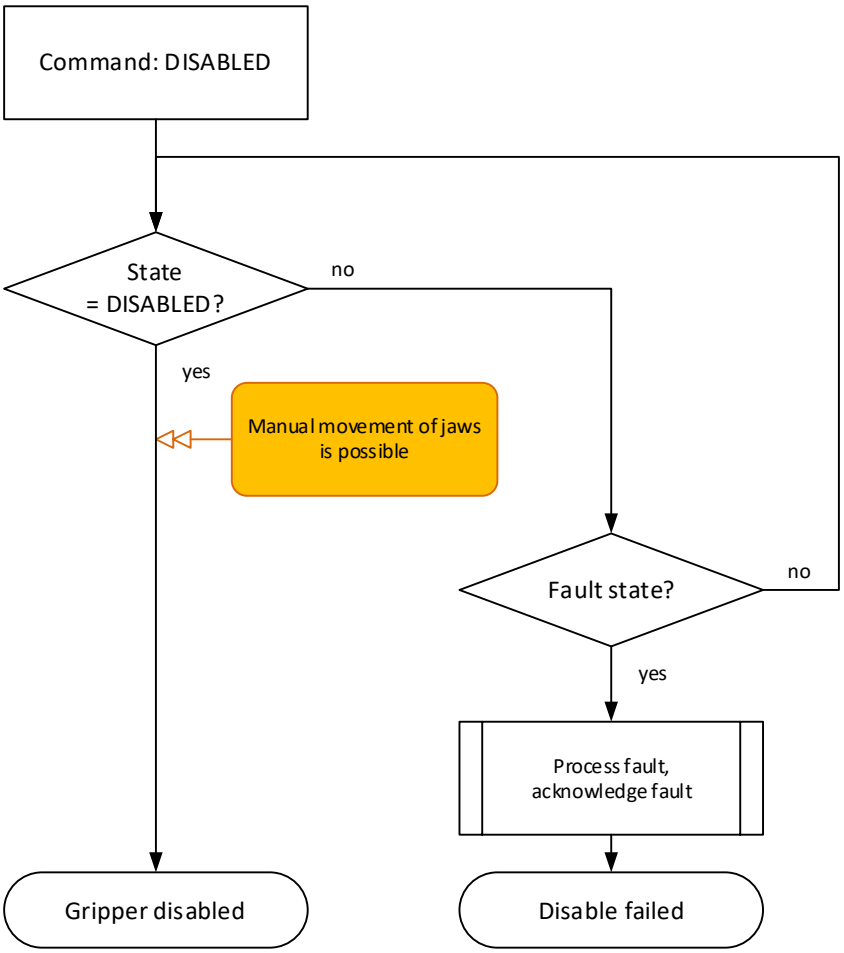


Figure 33: Disable program sequence ("DISABLE" command)

If the gripping module is enabled and no grip or release command has been executed, the drive is energized. The base jaws hold the current position and cannot be moved by hand.

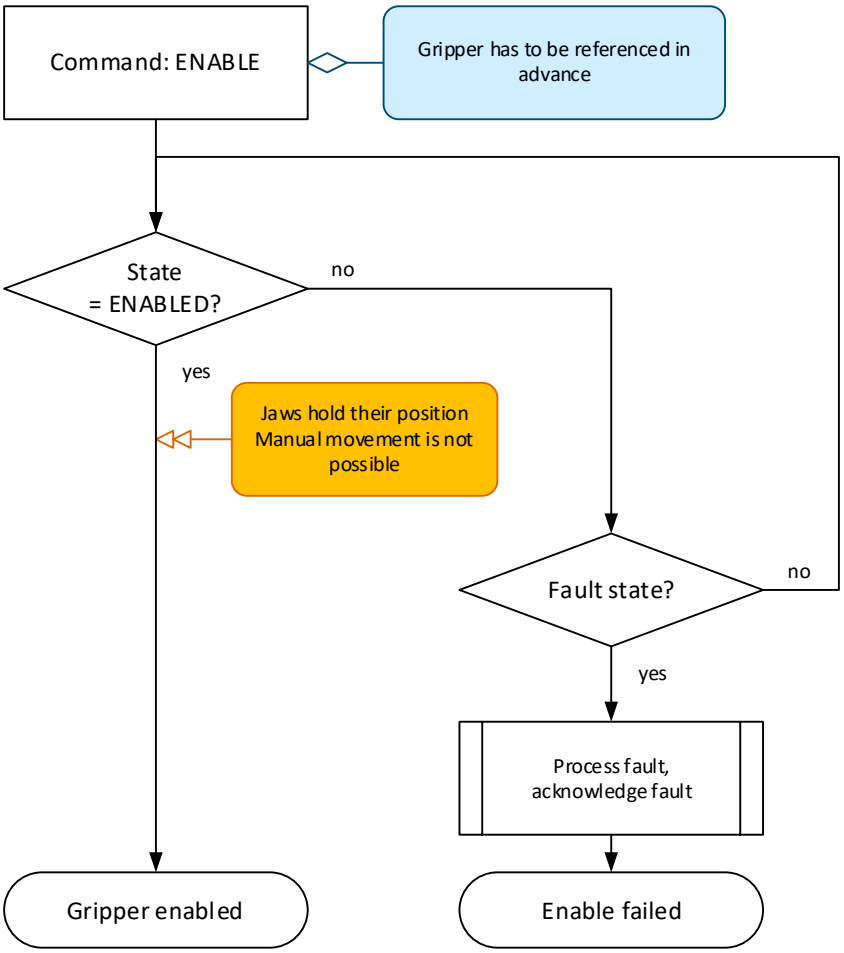


Figure 34: Enable program sequence ("ENABLE" command)

11.5 Release-Limit and No Part-Limit

A total of eight different grips can be parameterized for gripping different parts. The grip is selected in the corresponding commands via the transferred grip index and executed with the GRIP or RELEASE grip commands.

For parameterization, a position window is specified for each grip by the limit values RELEASE-Limit and NO PART-Limit, as shown in Figure 35 , in which the gripper must be located. If the base jaws block within this window when gripping, the gripping module recognizes this as a valid grip and switches to the HOLDING gripping state. However, if the base jaws reach the NO PART limit, the gripping state changes to NO PART to indicate that no part has been gripped. When RELEASING, the gripping state changes to RELEASED as soon as the base jaws reach the position of the RELEASE limit. If the RELEASE limit is not reached, the gripping state changes to FAULT.

If the base jaws block outside the position window, e.g. at the end stop of the movement, the workpiece is considered released or no part was detected, depending on the direction of movement.

Attention: Danger of collision! If the selected gripping range is not large enough, gripped parts that are too small or too large may be gripped, although the gripping state is NO PART or RELEASED. In case of doubt, evaluate the position value!

The "RELEASE limit" and "NO PART limit" parameters must be selected with a sufficient safety margin to their limit values. Gripping and releasing at the end stops must be avoided.

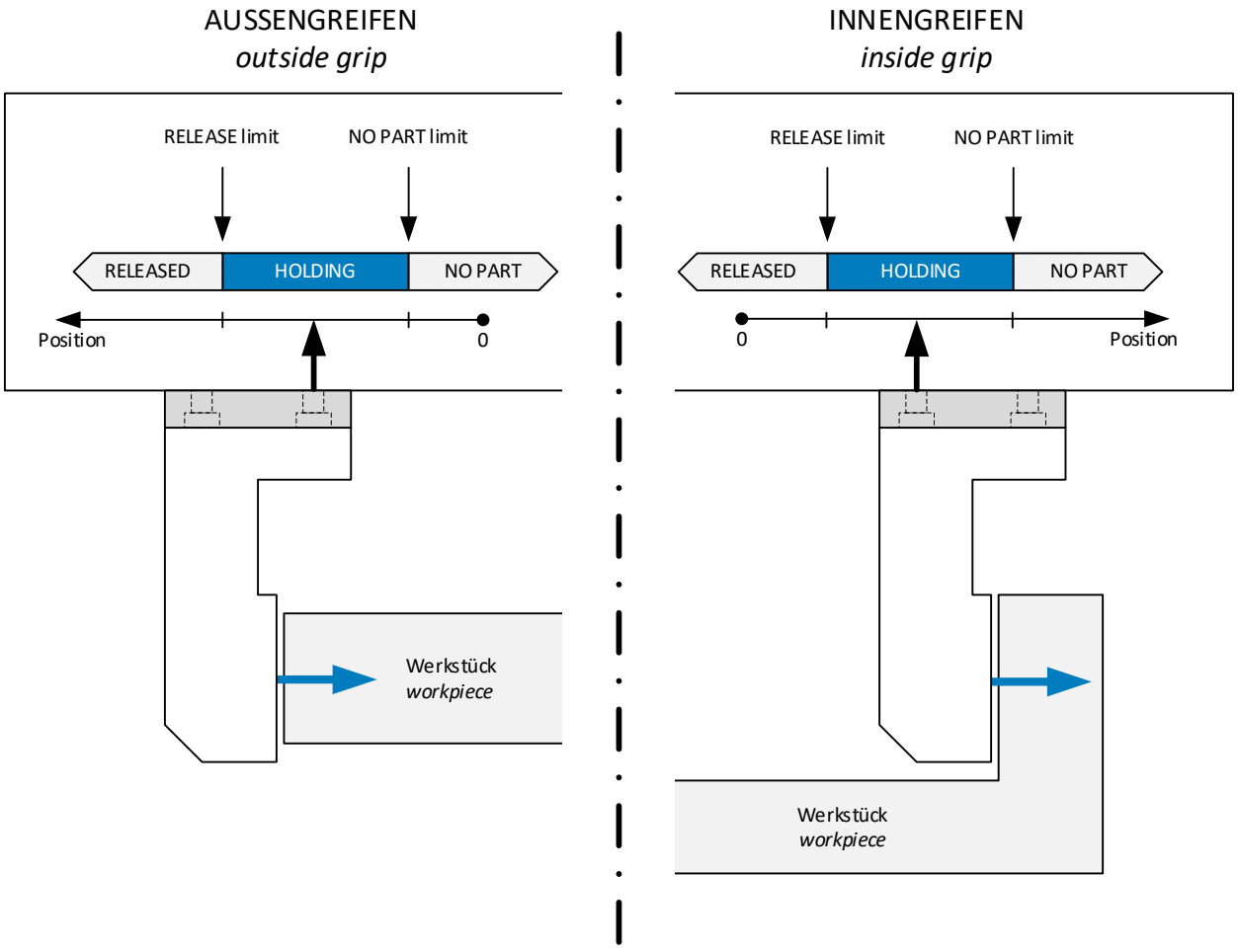


Figure 35: Gripping range and gripping direction

11.5.1 Gripping direction

The gripping direction is determined by the two limit values NO PART limit and RELEASE limit: if the position for the NO PART limit is smaller than that for the RELEASE limit, the gripper module grips inwards (Figure 35, "Outside grip"). Conversely, the gripper module grips outwards (Figure 35 , "Inside grip") if the position for the NO PART limit is greater than that for the RELEASE limit.

11.6 Grip workpiece

The program sequence for gripping a part is shown in Figure 36. The gripping module must be initialized prior to gripping. The gripping process can be started via the grip command of the command set. The index of the desired grip preset is given as a parameter. The gripping direction depends on the parameterization of the selected grip preset.

The WSTR command is used to determine the end of the gripping process or any error that may have occurred. If the parameterizable NO PART limit is reached, no part was gripped and the base jaws remain in this position.

If an error has occurred during gripping (gripping module is in FAULT state), this must be acknowledged. This is done by disabling the gripping module (see section 11.8).

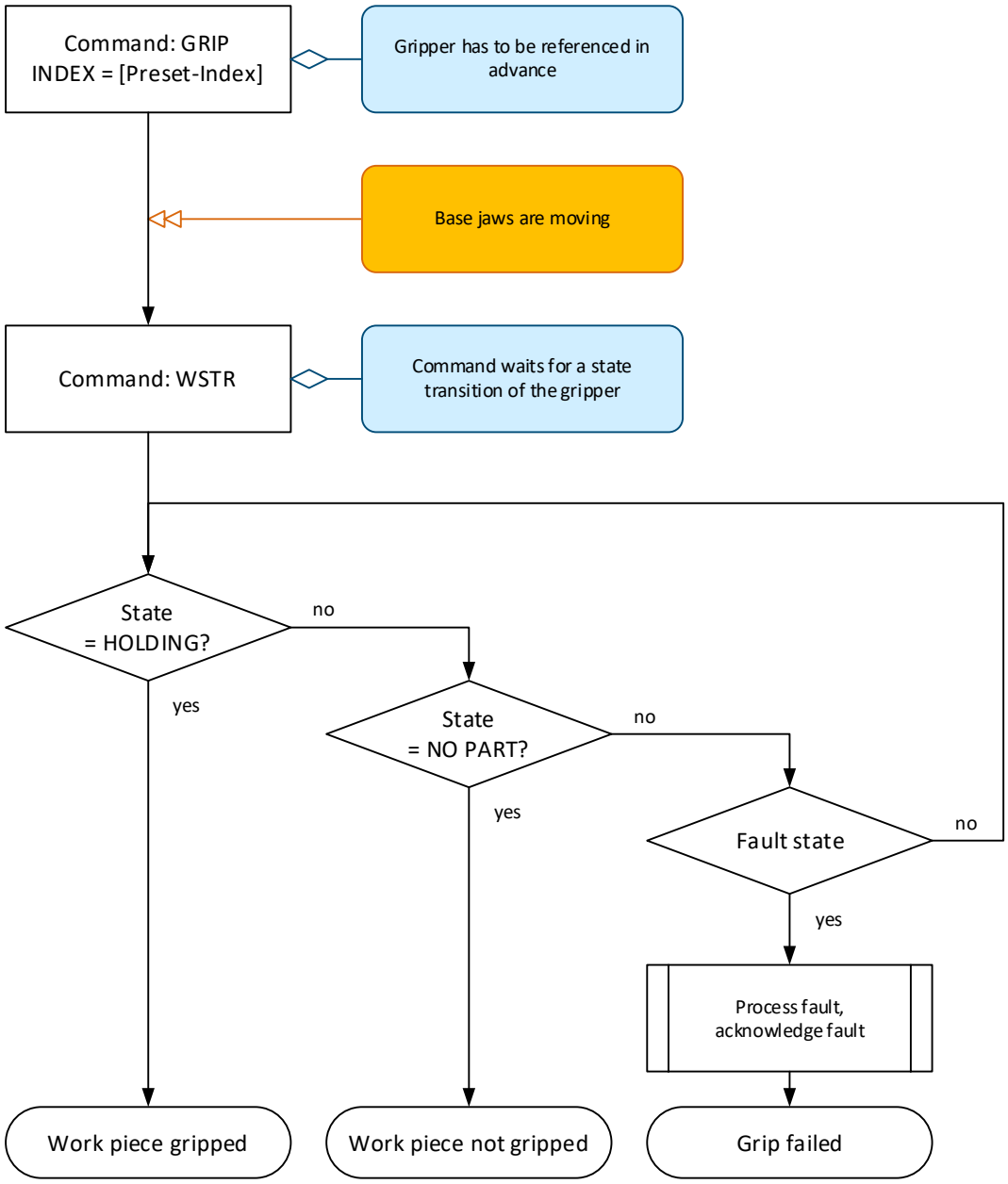


Figure 36: Gripping program sequence with predefined preset ("GRIP" command)

11.7 Release workpiece

To release a previously executed grip and release the gripped part, the program sequence in Figure 37 must be executed. The release process can be started via the release command of the command set ("RELEASE" for predefined presets or "FLEXRELEASE" with direct parameter transfer). The command is given the index of the desired grip.

The WSTR command is used to determine the end of the gripping process or any error that may have occurred. If the parameterized RELEASE limit is reached, the base jaws are at the release position and remain there in a position-controlled manner, but with reduced force.

Any errors that occur must be acknowledged in the same way as for the gripping process.

To change between grip presets, first release the part and then change the grip index.

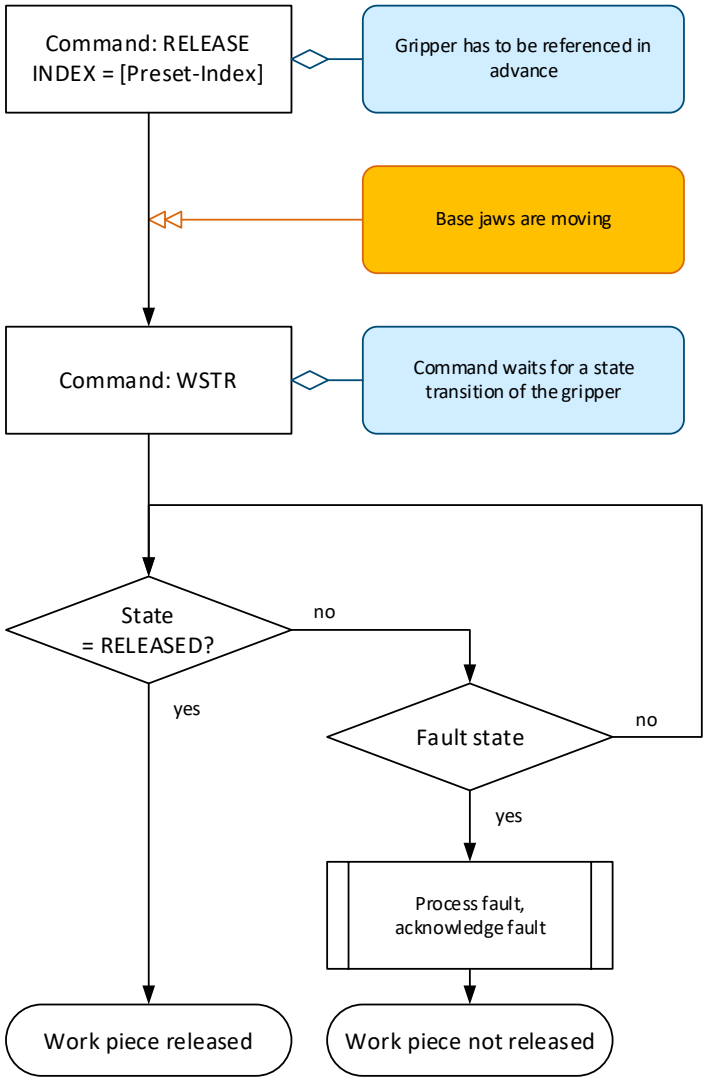


Figure 37 : Program sequence Release part with predefined preset ("RELEASE" command)

Be sure to keep the travel area of the fingers clear during the release run to avoid collisions and damage to the gripping module.

11.8 Error handling

Error handling in the FAULT state is necessary to prevent damage to the gripping module or the system, as well as injuries!

If the gripping module is in the FAULT state, an internal error has occurred that prevents the gripping module from functioning correctly.

To acknowledge an error, the gripping module must be disabled.

To acknowledge an error, deactivate the gripping module (see section 11.4). If the error cannot be acknowledged, try restarting the gripping module by interrupting the power supply. If the error persists, contact WEISS ROBOTICS technical support. There may be a defect in the gripping module.

Part loss possible! Move to a safe position before acknowledging the error.

11.9 Design of the gripping process

The design of the gripping process is decisive for the reliability of the production process. The following points have proven to be helpful:

- If possible, secure the gripping part position with a positive fit between the contact surface on the finger and the gripping surface on the gripping part.
- Avoid overdetermination during contact with the gripping part by designing the contact surfaces accordingly.
- Use a compensating element if lateral forces can occur on the gripping module due to gripping or positioning tolerances. This is the case, for example, if a clamped gripped part is to be picked up by a gripping module positioned by a robot.
- Select a sufficiently large gripping range (recommended distance between the RELEASE limit and the NO PART limit ≥ 5 mm) to maximize the reliability of the gripping process.
- Always maintain a distance from the stroke stop with the positions for the RELEASE limit and the NO PART limit so that the grip can be reliably detected and the gripper module does not grip itself.
- Select a sufficiently high gripping force. Please note that excessive gripping forces can damage the gripping part under certain circumstances!
- When holding, the continuous application of gripping force generates increased waste heat, which must be dissipated from the gripping module. Therefore, ensure sufficient heat dissipation via the

mounting surface. Avoid continuous holding and do not block the fingers outside the actual gripping (e.g. by setting the RELEASE limit outside the stroke range) in order to prevent the gripping module from heating up unnecessarily.

The following application examples describe the implementation of simple handling tasks and the associated parameterization and use of the gripping module.

11.9.1 Application example: gripping outside

Figure 38 shows an example of the external gripping of a KLT box. The box is to be gripped and then placed on a shelf. The distance between the gripping surfaces corresponds to the position of the base jaws of **235 mm**. To ensure a reliable gripping process, a **position tolerance of ±5 mm** is specified. The RELEASE limit must be increased accordingly so that the gripper inserts leave the grooves of the KLT box with sufficient clearance. The required gripping force of **350 N** was determined empirically through tests. To prevent damage to the component, the gripping speed and gripping acceleration are reduced. The part is parameterized as GRIP 0 of the gripper module. The parameters of the grip can now be set either via the web interface or using the corresponding command via the network interface.

Grip parameters:

Tag	*Preset0*
NO PART limit	230 mm
RELEASE limit	260 mm
Gripping force	350 N

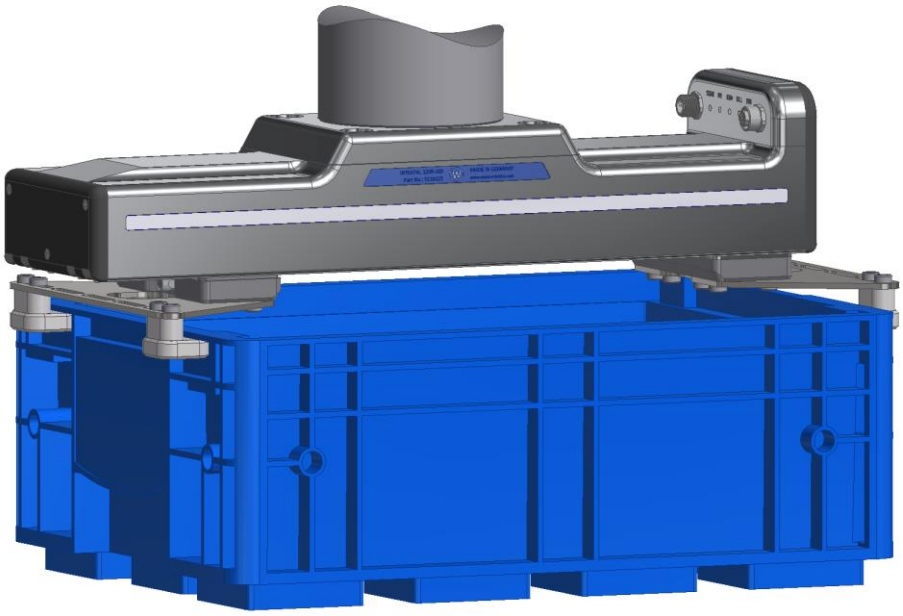


Figure 38: Application example: gripping outside

The gripping process is executed via the program sequences in Figure 36 (gripping workpiece) and Figure 37 (releasing workpiece) or, if GRIPLINK technology is used, directly via the GRIPLINK plug-in on the robot controller. As GRIP 0 has been parameterized, the gripping index 0 must be used in the program sequence.

11.9.2 Application example: gripping inside

In an intralogistics process, a beverage crate is to be picked up and stacked with the gripping module. As the crates are to be placed close together, the grip must be applied to the inside of the crate. The gripping application is shown in Figure 39.

Handle parameters:

Tag	*Preset1*
NO PART limit	280 mm
RELEASE limit	255 mm
Gripping force	500 N

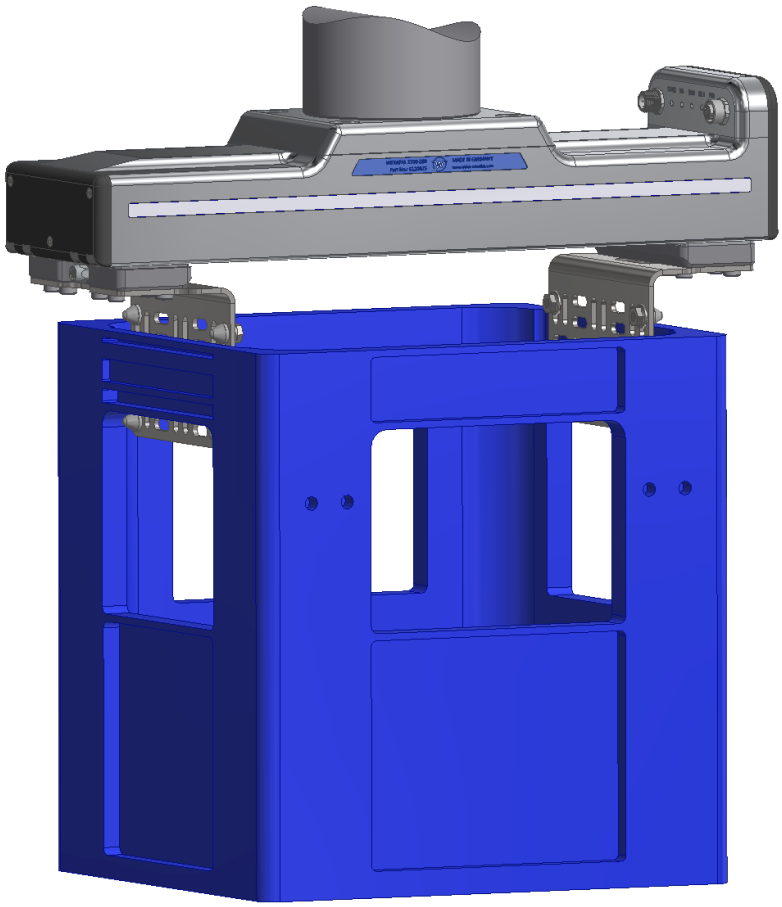


Figure 39: Application example: gripping inside

12 Maintenance

The installed ball screw is susceptible to maintenance and must be lubricated every 1 million cycles during normal operation or as required. Carry out the following steps in the specified order:

1. Move the base jaw to a center position. To do this, send the release command with the corresponding "Release Limit". Avoid moving the base jaw by hand if the module is ENABLED.
2. Switch off the power supply to the gripping module completely.

Disconnect the power supply to the gripping module before carrying out the next steps.

3. Unscrew the three screws (1) and remove the side cover (2) as shown in Figure 40. Use the hexagonal screwdriver from the accessory kit.
4. Unscrew the four screws (3) and remove the top cover (4).
5. If the ball screw drive (5) is dirty or you suspect that there are foreign objects in it, first clean it with a dry, lint-free cloth.
6. Place a grease gun on the NZ 3 grease nipple (6) and press the lubricant into the lubrication unit.
7. Install the covers (4) and (2) and move the gripper at least once over the entire stroke to distribute the lubricant evenly.

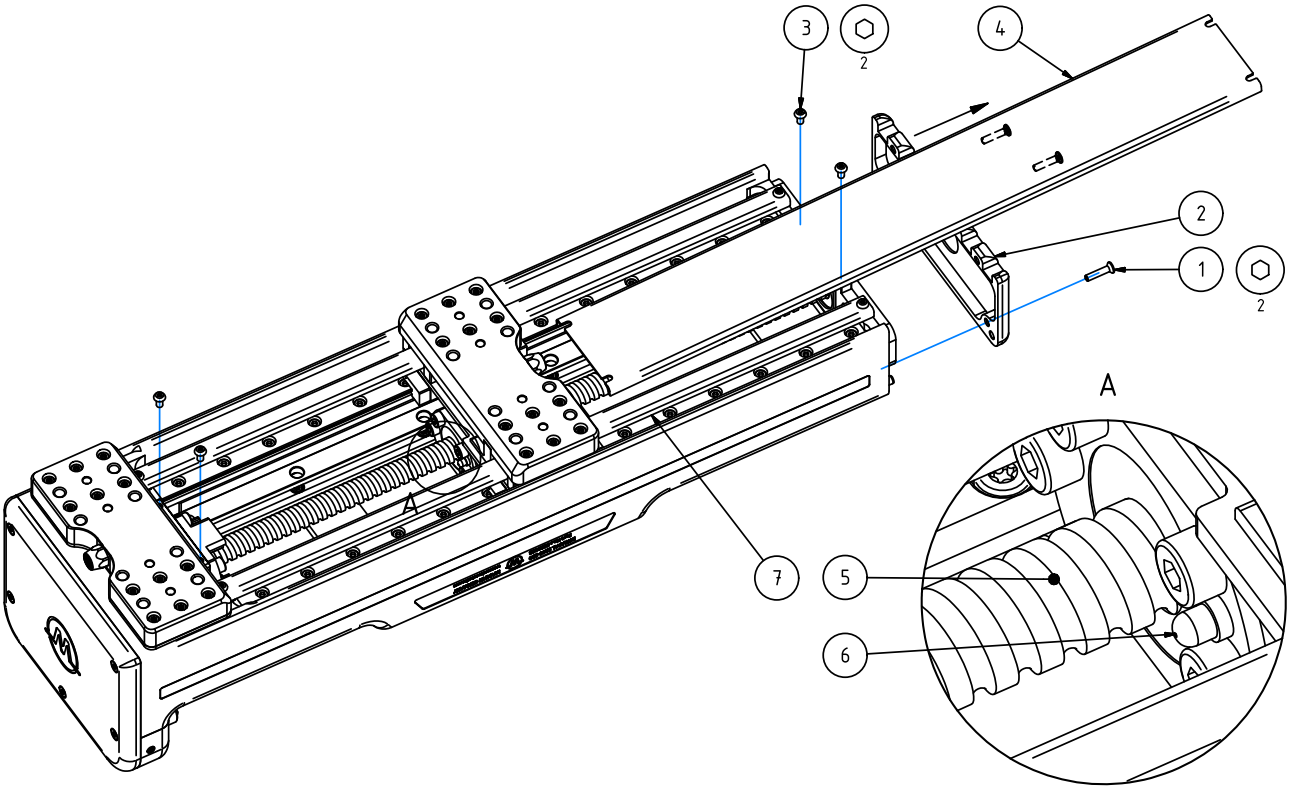


Figure 40: Removing the cover and lubricating the ball screw drive

If the guide rails are dirty or there is a suspect of foreign objects in them, the two small upper covers (7) can be removed to facilitate access to the guide rails. Clean the gripping module regularly with a dry cloth to remove dirt and any chips.
Suggested lubricant and grease gun (not evaluated):

- **NSK hand grease pump incl. straight nozzle**
- **Grease gun attachment tube with connection piece (NSK HGP NZ3)**
- **NSK GRS AS2 grease**

The maintenance intervals must be adapted to the ambient and operating conditions. The following factors must be taken into account:

- Increased operating temperatures
- Influence of foreign substances, especially abrasive or chemically active substances
- High vibration stress
- Use in a vacuum
- Highly dynamic operation

The gripping module is adjusted at the factory. Do not disassemble the gripping mechanism!

The gripper module counts the gripping cycles itself and, after 1 million cycles, displays the status “Service required” in the device overview by default (see Figure 41). In addition, the device condition is reduced to up to 50 %.
After maintenance has been performed, the status display can be reset via “Confirm Maintenance” in the advanced settings (see Figure 42). After maintenance has been confirmed, the gripping module starts counting the cycles again from zero.

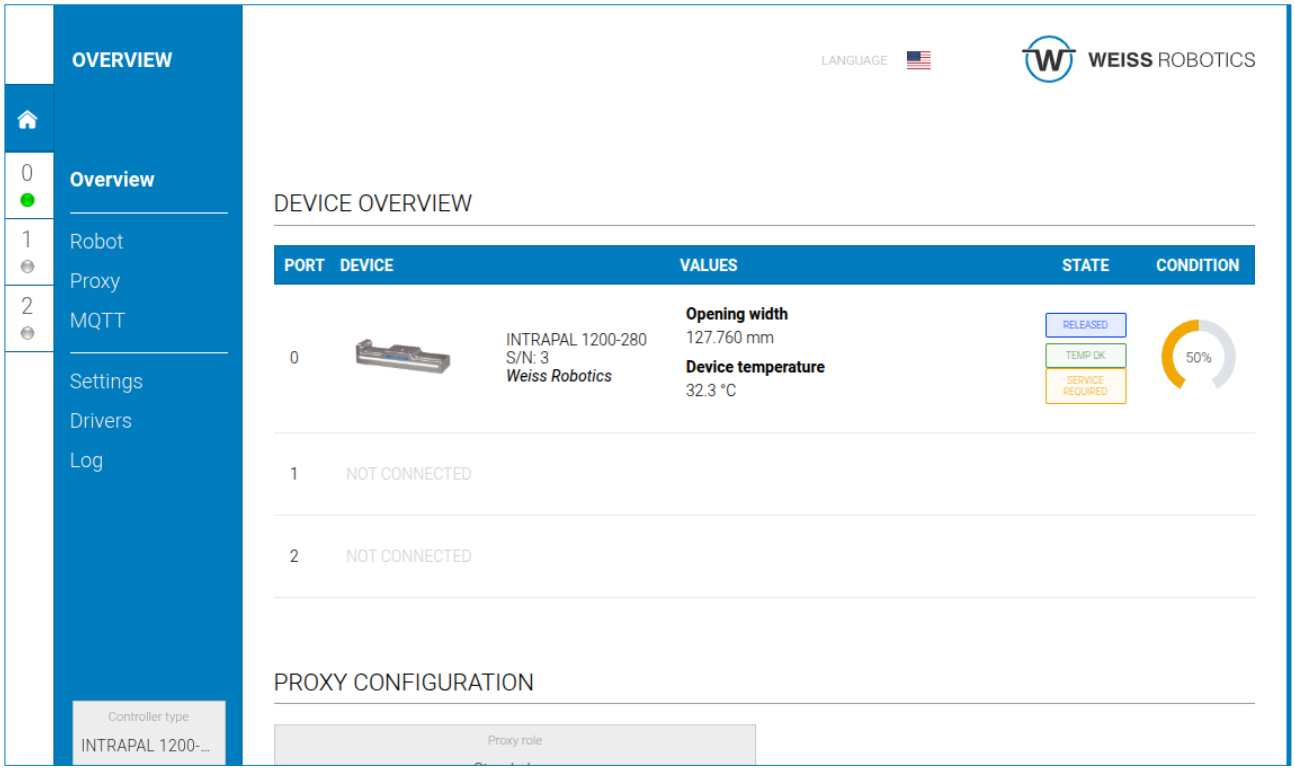


Figure 41: “Service required” status

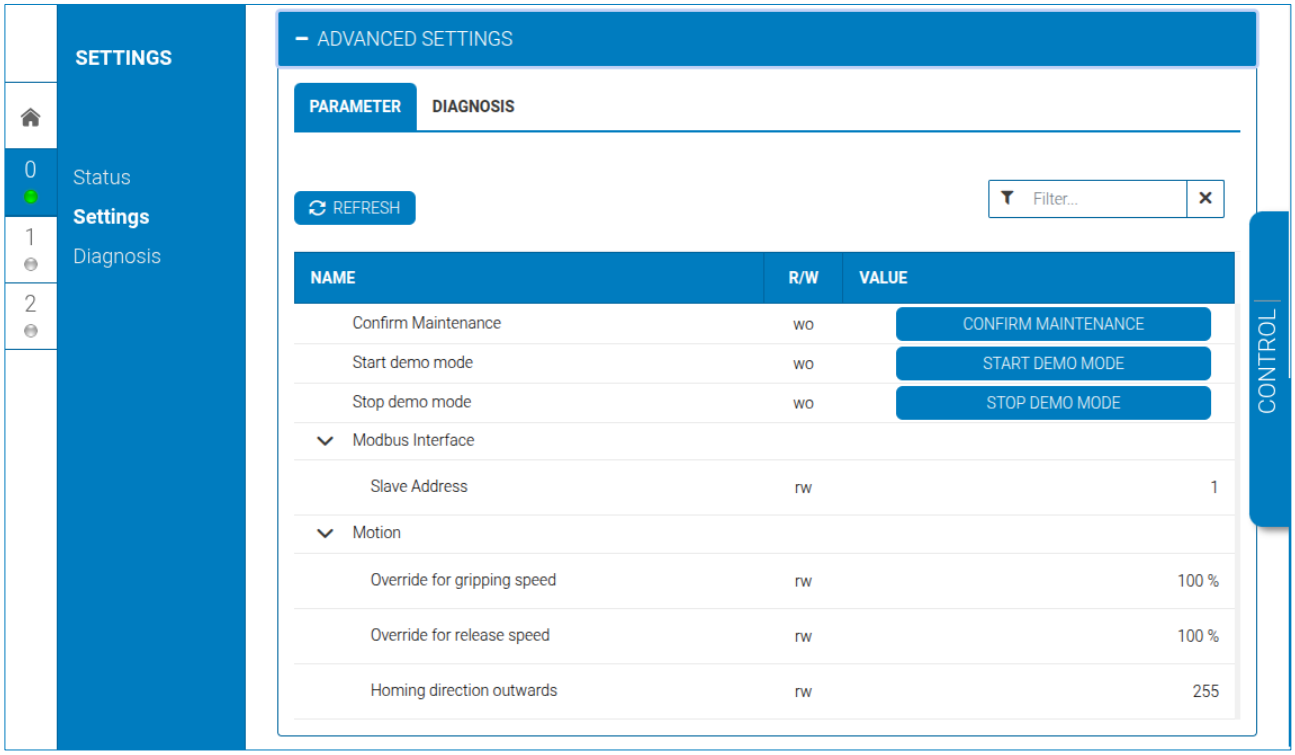


Figure 42: Confirm maintenance

13 Troubleshooting

13.1 Base jaw does not move

Possible cause	Remedy
Operating voltage too low or power supply insufficient	• Check power supply • Check power supply requirements
Communication with the gripping module is not possible.	• Check communication cable and connections • Check the network settings of the robot/computer • Check built-in network components such as switches
Error message in the system	• Check the operating status of the gripping module • Restart gripping module, if error recurs send gripping module with a repair order to WEISS ROBOTICS for repair
Failure of a component, e.g. due to overload	• Send the gripping module to WEISS ROBOTICS with a repair order • Ensure that the gripping module is only used within its defined application parameters

13.2 The gripping module reports an error

The gripping module is in FAULT status.

Error code from the gripping module	Remedy
Movement error	The base jaws do not move despite a movement command. If this error occurs repeatedly, the drive is defective. Send the gripping module with a repair order to WEISS ROBOTICS for repair.
Temperature error	The temperature inside the gripping module is above the maximum permissible temperature range. **It is strongly recommended to stop the gripping module and only continue operating it after it has cooled down.** • Check the ambient conditions • Improve heat dissipation • Shorten holding cycles or reduce gripping force • Ensure that the base jaws are at a distance from the end stop in the RELEASED state. • Reduce heat input from outside. The error is automatically reset when the gripping module has cooled down. The gripping module remains ready for operation, even if further operation is not recommended.
General error	Restart by restarting the device

For error handling, see chapter 11.811.5.1.

13.3 Gripper module stops abruptly or does not run the entire stroke

Possible cause	Remedy
Incorrect parameterization	• Check parameterization
Power supply interrupted	• Check power supply
No communication with the gripping module possible	• Check communication cable and connections • Check the network settings of the robot/computer • Check built-in network components such as switches
Check gripping module for FAULT status	• Read out system log via web interface
Foreign parts in the movement system or module dirty	• Check movement with the gripping module switched off by moving the fingers by hand. • Remove foreign objects • Carry out cleaning and maintenance
Insufficient lubrication	• Carry out cleaning and maintenance

14 Decommissioning, disassembly and disposal

14.1 Decommissioning and disassembly

For disassembly, the assembly instructions in chapter6 must be worked through backwards.

Disconnect the power supply to the gripping module before carrying out any work.

14.2 Disposal

Any biological or chemical contamination must be removed from gripping modules that are no longer usable. They are not to be returned as a whole unit, but broken down into their component parts in accordance with local regulations for recycling or proper disposal. We will gladly take care of the disposal for you - contact us!

Disconnect the power supply to the gripping module before carrying out any work.

The national and international laws and regulations must be observed during disposal.

15 EC Declaration of Incorporation

In accordance with the EC Machinery Directive 2006/42/EC, Annex II B

Manufacturer	WEISS ROBOTICS GmbH & Co KG Karl-Heinrich-Käferle-Str. 8 D-71640 Ludwigsburg
Distributor	WEISS ROBOTICS GmbH & Co. KG Karl-Heinrich-Käferle-Str. 8 D-71640 Ludwigsburg

We hereby declare that the following product:

Product Name:	Servo-electric gripper modules INTRAPAL
Type designation:	INTRAPAL 1200-280
Part numbers:	5120025

complies with the applicable essential requirements of the **Machinery** Directive **(2006/42/EC).**
The partly completed machinery must not be put into service until it has been established that the machine into which the partly completed machinery is to be incorporated complies with the provisions of the Machinery Directive (2006/42/EC).
Applied harmonized standards, in particular:

EN ISO 12100-1	Safety of machinery - Basic concepts, general principles for design, Part 1: Basic terminology, methodology
EN ISO 12100-2	Safety of machinery - Basic concepts, general principles for design, Part 2: Technical principles and specifications

The manufacturer undertakes to provide the specific technical documentation for the partly completed machinery to national authorities on request. The special technical documents belonging to the partly completed machinery in accordance with Annex VII Part B have been prepared.

Person responsible for documentation: Dr.-Ing. Karsten Weiß, Tel.: +49(0)7141/94702-0

Place, date/signature:	Ludwigsburg, August 20, 2025
Details of the signatory	WEISS ROBOTICS GmbH & Co. KG

www.weiss-robotics.com